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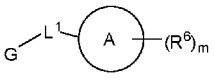
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(54) Title: HETEROCYCLIC COMPOUNDS DERIVATIVES AS PD-L1 INTERNALIZATION INDUCERS



(I')

(57) Abstract: Disclosed are compounds of Formula (I'), methods of using the compounds as immunomodulators, and pharmaceutical compositions comprising such compounds. The compounds inhibit PD-1/PD-L1 interaction and are useful in treating, preventing or ameliorating diseases or disorders such as cancer or infections.

HETEROCYCLIC COMPOUNDS DERIVATIVES AS PD-L1 INTERNALIZATION INDUCERS

FIELD OF THE INVENTION

The present application is concerned with pharmaceutically active compounds. The disclosure provides compounds as well as their compositions and methods of use. The compounds modulate PD-1/PD-L1 protein/protein interaction and are useful in the treatment of various diseases including infectious diseases and cancer.

BACKGROUND OF THE INVENTION

The immune system plays an important role in controlling and eradicating diseases such as cancer. However, cancer cells often develop strategies to evade or to suppress the immune system in order to favor their growth. One such mechanism is altering the expression of co-stimulatory and co-inhibitory molecules expressed on immune cells (Postow et al, J. Clinical Oncology 2015, 1-9). Blocking the signaling of an inhibitory immune checkpoint, such as PD-1, has proven to be a promising and effective treatment modality.

Programmed cell death-1 (PD-1), also known as CD279, is a cell surface receptor expressed on activated T cells, natural killer T cells, B cells, and macrophages (Greenwald et al, Annu. Rev. Immunol 2005, 23:515–548; Okazaki and Honjo, Trends Immunol 2006, (4):195-201). It functions as an intrinsic negative feedback system to prevent the activation of T-cells, which in turn reduces autoimmunity and promotes self-tolerance. In addition, PD-1 is also known to play a critical role in the suppression of antigen-specific T cell response in diseases like cancer and viral infection (Sharpe et al, *Nat Immunol* 2007 8, 239–245; Postow et al, J. Clinical Oncol 2015, 1-9).

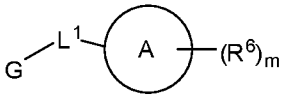
The structure of PD-1 consists of an extracellular immunoglobulin variable-like domain followed by a transmembrane region and an intracellular domain (Parry et al, Mol Cell Biol 2005, 9543–9553). The intracellular domain contains two phosphorylation sites located in an immunoreceptor tyrosine-based inhibitory motif and an immunoreceptor tyrosine-based switch motif, which suggests that PD-1 negatively regulates T cell receptor-mediated signals. PD-1 has two ligands, PD-L1 and PD-L2 (Parry et al, Mol Cell Biol 2005, 9543–9553; Latchman et al, Nat Immunol 2001, 2, 261–268), and they differ in their expression patterns. PD-L1 protein is upregulated on macrophages and dendritic cells in response to lipopolysaccharide and GM-CSF treatment, and on T cells and B cells upon T cell receptor and B cell receptor signaling. PD-L1 is also highly expressed on almost all

tumor cells, and the expression is further increased after IFN-γ treatment (Iwai et al, PNAS2002, 99(19):12293-7; Blank et al, Cancer Res 2004, 64(3):1140-5). In fact, tumor PD-L1 expression status has been shown to be prognostic in multiple tumor types (Wang et al, Eur J Surg Oncol 2015; Huang et al, Oncol Rep 2015; Sabatier et al, Oncotarget 2015, 6(7): 5449–5464). PD-L2 expression, in contrast, is more restricted and is expressed mainly by dendritic cells (Nakae et al, J Immunol 2006, 177:566-73). Ligation of PD-1 with its ligands PD-L1 and PD-L2 on T cells delivers a signal that inhibits IL-2 and IFN-γ production, as well as cell proliferation induced upon T cell receptor activation (Carter et al, Eur J Immunol 2002, 32(3):634-43; Freeman et al, J Exp Med 2000, 192(7):1027-34). The mechanism involves recruitment of SHP-2 or SHP-1 phosphatases to inhibit T cell receptor signaling such as Syk and Lck phosphorylation (Sharpe et al, Nat Immunol 2007, 8, 239–245). Activation of the PD-1 signaling axis also attenuates PKC-θ activation loop phosphorylation, which is necessary for the activation of NF-κB and AP1 pathways, and for cytokine production such as IL-2, IFN-γ and TNF (Sharpe et al, Nat Immunol 2007, 8, 239–245; Carter et al, Eur J Immunol 2002, 32(3):634-43; Freeman et al, J Exp Med 2000, 192(7):1027-34).

Several lines of evidence from preclinical animal studies indicate that PD-1 and its ligands negatively regulate immune responses. PD-1-deficient mice have been shown to develop lupus-like glomerulonephritis and dilated cardiomyopathy (Nishimura et al, Immunity 1999, 11:141–151; Nishimura et al, Science 2001, 291:319–322). Using an LCMV model of chronic infection, it has been shown that PD-1/PD-L1 interaction inhibits activation, expansion and acquisition of effector functions of virus-specific CD8 T cells (Barber et al, Nature 2006, 439, 682-7). Together, these data support the development of a therapeutic approach to block the PD-1-mediated inhibitory signaling cascade in order to augment or "rescue" T cell response. Accordingly, there is a need for new compounds that block PD-1/PD-L1 protein/protein interaction.

SUMMARY

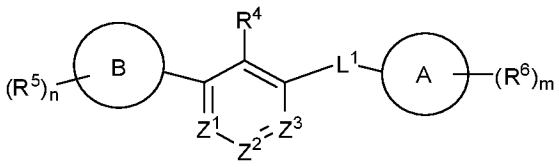
The present disclosure provides a compound of Formula (I'):



(I')

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein constituent variables are defined herein.

The present disclosure provides, *inter alia*, a compound of Formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein constituent variables are defined herein.

The present disclosure further provides a pharmaceutical composition comprising a compound disclosed herein, or a pharmaceutically acceptable salt or a stereoisomer thereof, and one or more pharmaceutically acceptable excipient or carrier.

The present disclosure further provides methods of inhibiting PD-1/PD-L1 interaction, said method comprising administering to a patient a compound disclosed herein, or a pharmaceutically acceptable salt or a stereoisomer thereof.

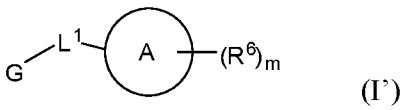
The present disclosure further provides methods of treating a disease or disorder associated with inhibition of PD-1/PD-L1 interaction, said method comprising administering to a patient in need thereof a therapeutically effective amount of a compound of disclosed herein, or a pharmaceutically acceptable salt or a stereoisomer thereof.

The present disclosure further provides methods of enhancing, stimulating and/or increasing the immune response in a patient, said method comprising administering to the patient in need thereof a therapeutically effective amount of a compound disclosed herein, or a pharmaceutically acceptable salt or a stereoisomer thereof.

DETAILED DESCRIPTION

I. Compounds

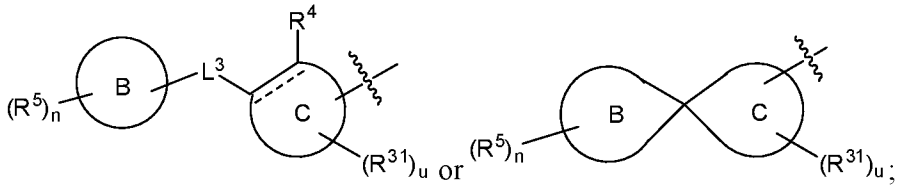
The present disclosure provides, *inter alia*, a compound of Formula (I'):



(I')

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

G has Formula (I'e) or (I'b)



(I'e) (I'b)

when G is of Formula (I'a), the atoms on ring C, to which the substituent R^4 and ring B are attached can be either carbon or nitrogen; and ==== is a single bond or a double bond;

when G is of Formula (I'b), ring B and ring C are joined together through a quaternary ring carbon atom to form a spiro structure and ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=S)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=S)(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NR^{13})NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NR^{13})(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NOR^{13})NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NOR^{13})(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NCN)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NCN)(CR^{14}R^{15})_t$ -, O, -$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-, -O$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-$(CR^{14}R^{15})_p$-, S, -$(CR^{14}R^{15})_p$-S-, -S$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-S-$(CR^{14}R^{15})_p$-, -NR^{13}-, -$(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t$ -, -NH-, -$(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t$-, -$CR^{13}$=$CR^{13}$-, —C≡C—, -$SO_2$-, -$(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t$ -, -$NR^{13}C(O)O$-, -$(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t$ -, -$O(CO)NR^{13}$-, –$NR^{13}C(O)NR^{13}$- or -$(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

L^3 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=S)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=S)(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NR^{13})NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NR^{13})(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NOR^{13})NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NOR^{13})(CR^{14}R^{15})_t$ -, – $(CR^{14}R^{15})_tC(=NCN)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NCN)(CR^{14}R^{15})_t$ -, O, -$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-, -O$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-$(CR^{14}R^{15})_p$-, S, -$(CR^{14}R^{15})_p$-S-, -S$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-S-$(CR^{14}R^{15})_p$-, -NR^{13}-, -$(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t$ -, -NH-, -$(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t$-, -$CR^{13}$=$CR^{13}$-, —C≡C—, -$SO_2$-, -$(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t$ -, -$NR^{13}C(O)O$-, -

$(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t$ -, -$O(CO)NR^{13}$-, –$NR^{13}C(O)NR^{13}$- or -$(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring C is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, -NHC_{1-4} alkyl and –$N(C_{1-4}$ alkyl$)_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, -NHC_{1-4} alkyl, -$N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^4 is H, halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, -NHR^8, -NR^8R^8, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5, R^6 and R^{31} are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN,

NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, $C(O)NR^aS(O)_2R^a$, $NR^aC(=NR^a)R^a$, $S(O)_2NR^aC(O)R^a$, $-P(O)R^aR^a$, $-P(O)(OR^a)(OR^a)$, $-B(OH)_2$, $-B(OR^a)_2$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5, R^6 and R^{31} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^{31} substituents on ring C, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{31} substituents on the same ring carbon atom of ring C, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN,

OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$, $C(O)NR^cS(O)_2R^c$, $NR^cC(=NR^c)R^c$, $S(O)_2NR^cC(O)R^c$, $-P(O)R^cR^c$, $-P(O)(OR^c)(OR^c)$, $-B(OH)_2$, $-B(OR^c)_2$, and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$, $NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$, $NR^gS(O)_2NR^gR^g$, $C(O)NR^gS(O)_2R^g$, $NR^gC(=NR^g)R^g$, $S(O)_2NR^gC(O)R^g$, $-P(O)R^gR^g$, $-P(O)(OR^g)(OR^g)$, $-B(OH)_2$, $-B(OR^g)_2$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10

membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 independently selected R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, $C(O)NR^oS(O)_2R^o$, $NR^oC(=NR^o)R^o$, $S(O)_2NR^oC(O)R^o$, $-P(O)R^oR^o$, $-P(O)(OR^o)(OR^o)$, $-B(OH)_2$, $-B(OR^o)_2$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, $C(O)NR^eS(O)_2R^e$, $NR^eC(=NR^e)R^e$, $S(O)_2NR^eC(O)R^e$, $-P(O)R^eR^e$, $-P(O)(OR^e)(OR^e)$, $-B(OH)_2$, $-B(OR^e)_2$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 independently selected R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$, $C(O)NR^rS(O)_2R^r$, $NR^rC(=NR^r)R^r$, $S(O)_2NR^rC(O)R^r$, $-P(O)R^rR^r$, $-P(O)(OR^r)(OR^r)$, $-B(OH)_2$, $-B(OR^r)_2$, and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, $C(O)NR^iS(O)_2R^i$, $NR^iC(=NR^i)R^i$, $S(O)_2NR^iC(O)R^i$, $P(O)R^iR^i$, $-P(O)(OR^i)(OR^i)$, $-B(OH)_2$, $-B(OR^i)_2$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10

membered heteroaryl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 independently selected R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$, $NR^kS(O)_2NR^kR^k$, $C(O)NR^kS(O)_2R^k$, $NR^kC(=NR^k)R^k$, $S(O)_2NR^kC(O)R^k$, $P(O)R^kR^k$, $-P(O)(OR^k)(OR^k)$, $-B(OH)_2$, $-B(OR^k)_2$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4} haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents, or 1, 2, or 3 independently selected R^q substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents, or 1, 2, or 3 independently selected R^q substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4} alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl, 5- or 6-membered heteroaryl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

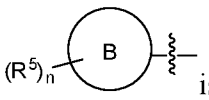
the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

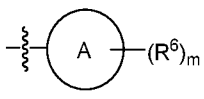
each subscript p is independently an integer of 1, 2, 3 or 4;

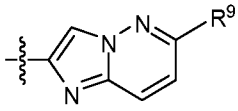
each subscript t is independently an integer of 0, 1, 2, 3 or 4;

the subscript u is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

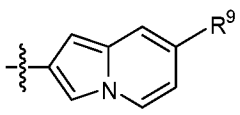
with the provisos:

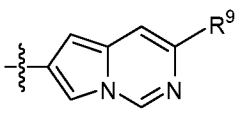
(i) when L^1 is a bond and 

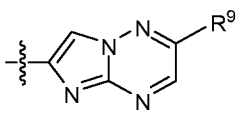
is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then 

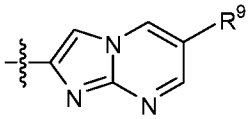
is not 

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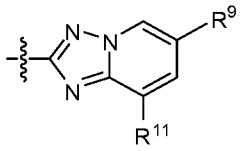
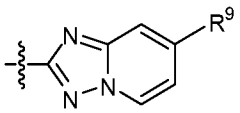
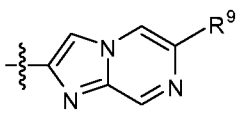
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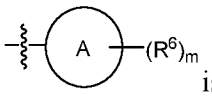
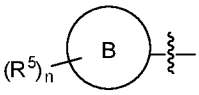
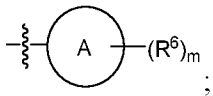
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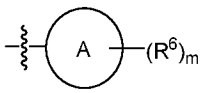
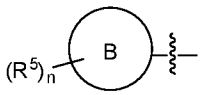
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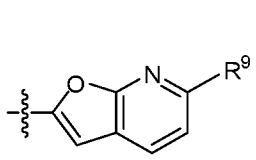
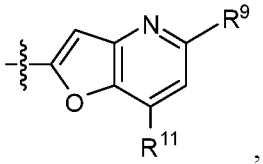
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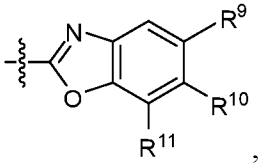
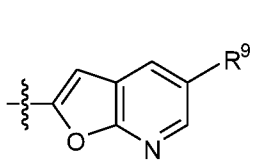
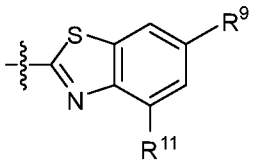
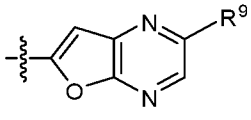



or


wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

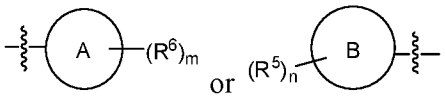
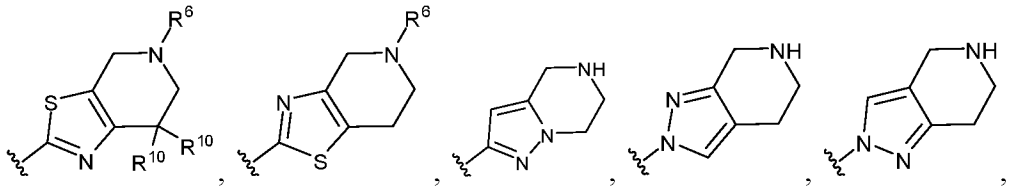
(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not any of the moieties set forth in proviso (i) above for ;

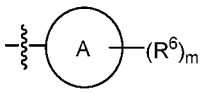
(iii) when L^1 is a bond, then  or  is not

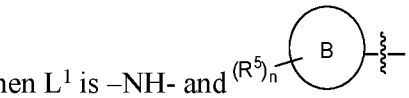
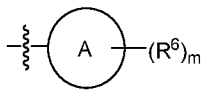
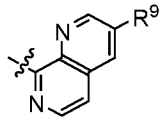
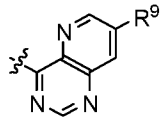
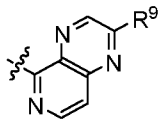






or


, wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  is not  wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

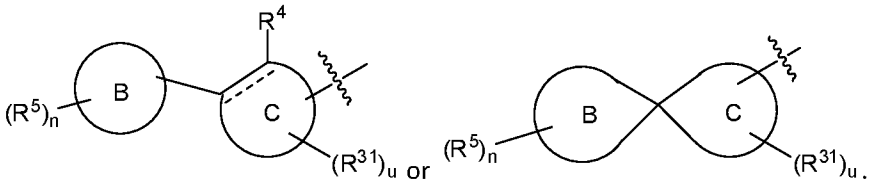
(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

In some embodiments, G has Formula (I'a) or (I'b):



(I'a) (I'b)

In some embodiments,

when ring C is 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl,

R^4 is H, halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, $-NHR^8$, $-NR^8R^8$, $C(O)R^8$,

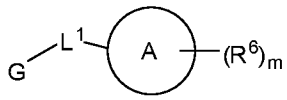
$C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$,

wherein each R^8 is independently H or C_{1-6} alkyl.

In some embodiments, R^4 is halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, $-NHR^8$, $-NR^8R^8$, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$;

wherein each R^8 is independently H or C_{1-6} alkyl.

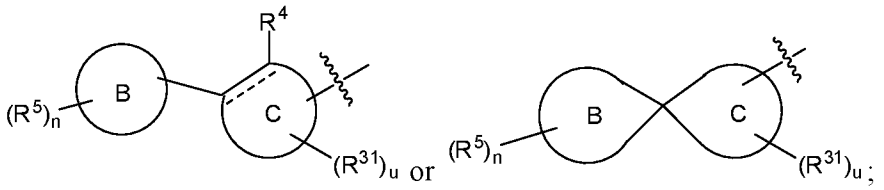
In some embodiments of the compound of Formula (I'):



(I')

or a pharmaceutically acceptable salt or a stereoisomer thereof,

G has Formula (I'a) or (I'b)



(I'a) (I'b)

when G is of Formula (I'a), the atoms on ring C, to which the substituent R^4 and ring B are attached can be either carbon or nitrogen; and ---- is a single bond or a double bond;

when G is of Formula (I'b), ring B and ring C are joined together through a quaternary ring carbon atom to form a spiro structure and ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t$ -, O, $-(CR^{14}R^{15})_p$-, $-(CR^{14}R^{15})_p$-O-, $-O(CR^{14}R^{15})_p$-, $-(CR^{14}R^{15})_p$-O-$(CR^{14}R^{15})_p$-, $-NR^{13}$-, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t$ -, -NH-, $-(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t$-, $-CR^{13}=CR^{13}$-, —C≡C—, $-SO_2$-, $-(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t$ -, -

$(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t$ -, -$NR^{13}C(O)O$-, -$(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t$ -, -$O(CO)NR^{13}$-, –$NR^{13}C(O)NR^{13}$- or -$(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring C is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, -NHC_{1-4} alkyl and –$N(C_{1-4}$ alkyl$)_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, -NHC_{1-4} alkyl, -$N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^4 is halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, -NHR^8, -NR^8R^8, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5, R^6 and R^{31} are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-

, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5, R^6 and R^{31} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered

heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^{31} substituents on ring C, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{31} substituents on the same ring carbon atom of ring C, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c,

NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$ and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$, $NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$, $NR^gS(O)_2NR^gR^g$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 independently selected R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10

membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10

membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 independently selected R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$ and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 independently selected R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$,

$NR^kS(O)_2NR^kR^k$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4} haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4}

alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl, 5- or 6-membered heteroaryl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

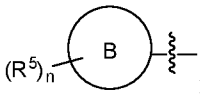
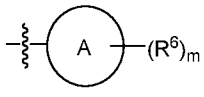
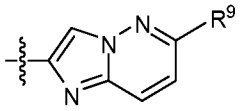
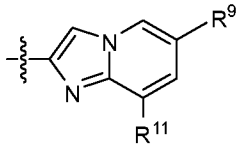
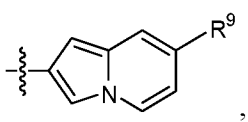
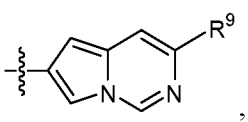
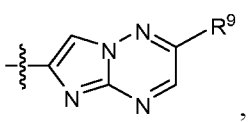
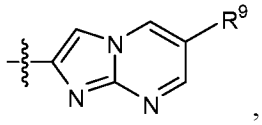
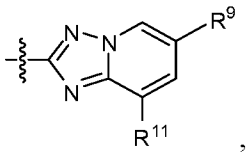
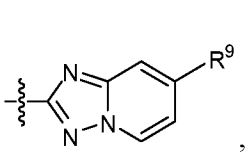
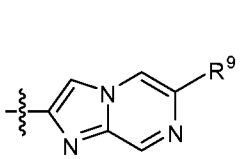
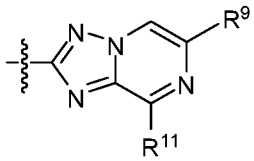
the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

each subscript p is independently an integer of 1, 2, 3 or 4;

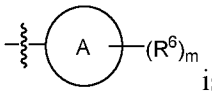
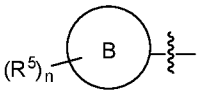
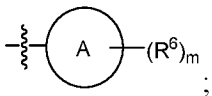
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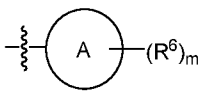
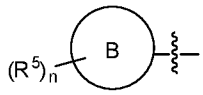
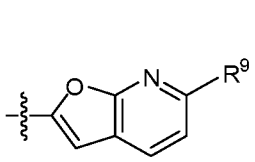
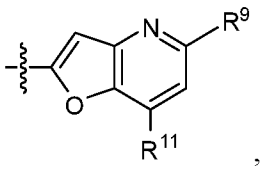
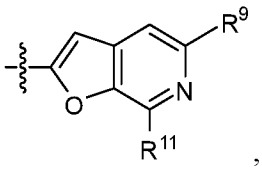
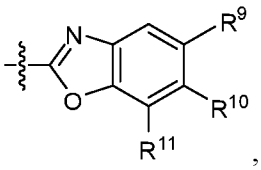
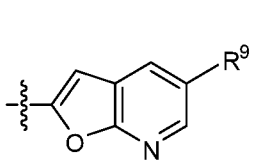
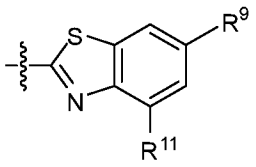
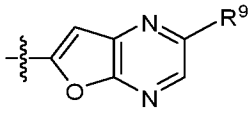
the subscript u is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

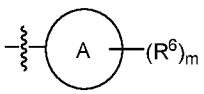
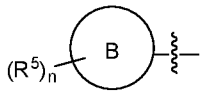
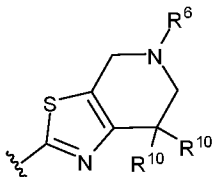
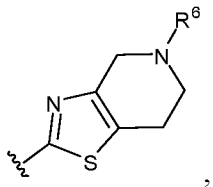
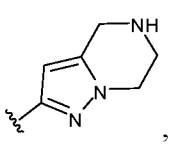
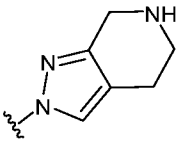
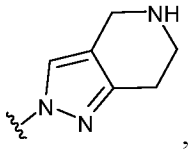
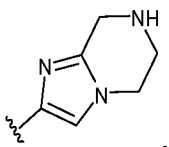
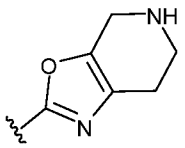
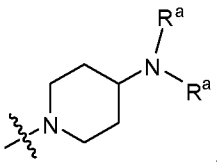
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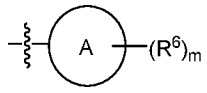
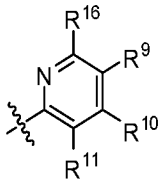
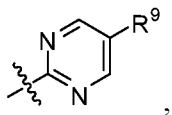
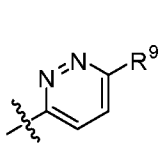
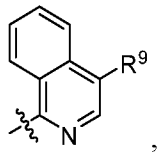
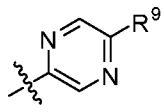
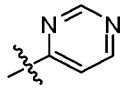
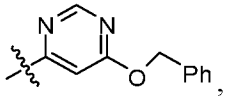
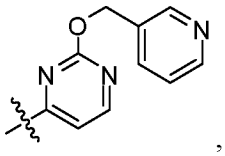
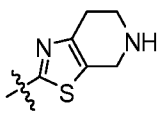
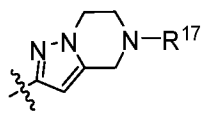
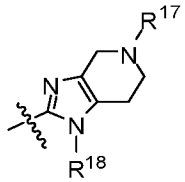
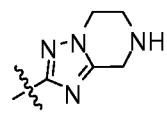
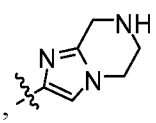
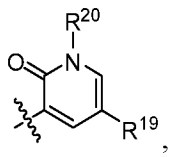
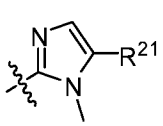
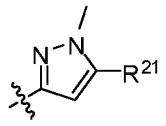
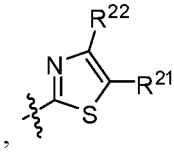
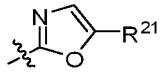
(i) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not , , , , , , , ,  or ,

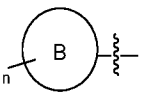
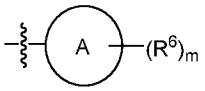
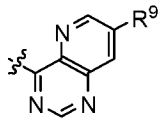
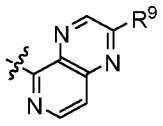
wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not any of the moieties set forth in proviso (i) above for ;

(iii) when L^1 is a bond, then  or  is not , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  or  is not , , , , , ,  or , wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not , , , , , , , , , , , , , , , , , , , or , wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

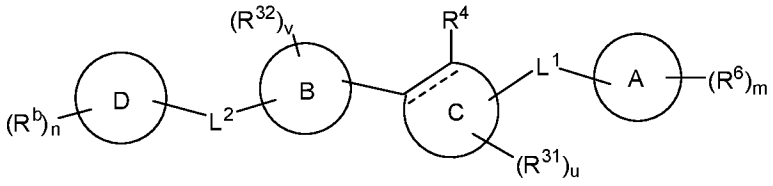
(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

In some embodiments, the present disclosure provides a compound of Formula (I'c):



(I'c)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

ring D is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^2 is a bond, $–(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t-$, O, $-(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-$, $-O(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-(CR^{29}R^{30})_q-$, $-NR^{28}-$, $-(CR^{29}R^{30})_wNR^{28}(CR^{29}R^{30})_w-$, -NH-, $-(CR^{29}R^{30})_wNH(CR^{29}R^{30})_w-$, $-CR^{28}=CR^{28}-$, $—C\equiv C—$, $-SO_2-$, $-(CR^{29}R^{30})_wSO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wSO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}C(O)O(CR^{29}R^{30})_w-$, $-NR^{28}C(O)O-$, $-(CR^{29}R^{30})_wO(CO)NR^{28}(CR^{29}R^{30})_w-$, $-O(CO)NR^{28}-$, $–NR^{28}C(O)NR^{28}-$ or $-(CR^{29}R^{30})_wNR^{28}C(O)NR^{28}(CR^{29}R^{30})_w$;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $–N(C_{1-4}$ alkyl$)_2$;

R^{29} and R^{30} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

each R^{32} is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{32} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^{32} substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

the subscript n is an integer of 0, 1, 2, 3, 4, 5;

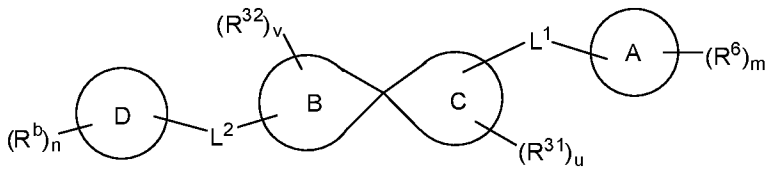
the subscript v is an integer of 0, 1, 2, 3, 4, 5, 6 or 7

each subscript q is independently an integer of 1, 2, 3 or 4;

each subscript t is independently an integer of 0, 1, 2, 3 or 4; and

each subscript w is independently an integer of 0, 1, 2, 3 or 4.

In some embodiments, the present disclosure provides a compound of Formula (I'd):



(I'd)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring D is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^2 is a bond, $-(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t$-, $-(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t$ -, O, $-(CR^{29}R^{30})_q$-, $-(CR^{29}R^{30})_q$-O-, $-O(CR^{29}R^{30})_q$-, $-(CR^{29}R^{30})_q$-O-$(CR^{29}R^{30})_q$-, $-NR^{28}$-, $-(CR^{29}R^{30})_wNR^{28}(CR^{29}R^{30})_w$-, -NH-, $-(CR^{29}R^{30})_wNH(CR^{29}R^{30})_w$-, $-CR^{28}=CR^{28}$-, —C≡C—, $-SO_2$-, $-(CR^{29}R^{30})_wSO_2(CR^{29}R^{30})_w$-, $-(CR^{29}R^{30})_wSO_2NR^{28}(CR^{29}R^{30})_w$-, $-(CR^{29}R^{30})_wNR^{28}SO_2(CR^{29}R^{30})_w$-, $-(CR^{29}R^{30})_wNR^{28}SO_2NR^{28}(CR^{29}R^{30})_w$-, $-(CR^{29}R^{30})_wNR^{28}C(O)O(CR^{29}R^{30})_w$-, $-NR^{28}C(O)O$-, $-(CR^{29}R^{30})_wO(CO)NR^{28}(CR^{29}R^{30})_w$-, $-O(CO)NR^{28}$-, $-NR^{28}C(O)NR^{28}$- or $-(CR^{29}R^{30})_wNR^{28}C(O)NR^{28}(CR^{29}R^{30})_w$;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

R^{29} and R^{30} are each independently selected from H, halo, CN, OH, NH_2, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

each R^{32} is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-}

$_{4}$ alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{32} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^{32} substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{32} substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

the subscript n is an integer of 0, 1, 2, 3, 4, 5;

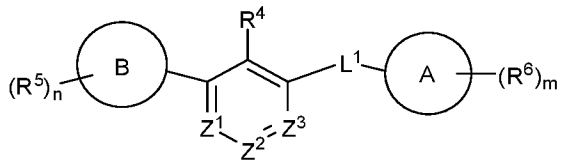
the subscript v is an integer of 0, 1, 2, 3, 4, 5, 6 or 7

each subscript q is independently an integer of 1, 2, 3 or 4;

each subscript t is independently an integer of 0, 1, 2, 3 or 4; and

each subscript w is independently an integer of 0, 1, 2, 3 or 4.

In some embodiments, the present disclosure provides a compound of Formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

Z^1 is N or CR^1;

Z^2 is N or CR^2;

Z^3 is N or CR^3;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t-$, O, $-(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-$, $-O(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-(CR^{14}R^{15})_p-$, $-NR^{13}-$, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t-$, -NH-, $-(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t-$, $-CR^{13}=CR^{13}-$, $-C\equiv C-$, $-SO_2-$, $-(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t-$, $-NR^{13}C(O)O-$, $-(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t-$, $-O(CO)NR^{13}-$, $-NR^{13}C(O)NR^{13}-$ or $-(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 11-membered heterocycloalkyl or C_{3-10} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 11-membered heterocycloalkyl or C_{3-10} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^1, R^2 and R^3 are each independently selected from H, C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl-, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, CN, OR^7, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, NH_2, $-NHR^7$, $-NR^7R^7$, $NHOR^7$, $C(O)R^7$, $C(O)NR^7R^7$, $C(O)OR^7$, $OC(O)R^7$, $OC(O)NR^7R^7$, $NR^7C(O)R^7$, $NR^7C(O)OR^7$, $NR^7C(O)NR^7R^7$, $C(=NR^7)R^7$, $C(=NR^7)NR^7R^7$, $NR^7C(=NR^7)NR^7R^7$, $NR^7S(O)R^7$, $NR^7S(O)_2R^7$, $NR^7S(O)_2NR^7R^7$, $S(O)R^7$, $S(O)NR^7R^7$, $S(O)_2R^7$, and $S(O)_2NR^7R^7$, wherein each R^7 is independently selected from H, C_{1-4} alkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, C_{1-4} alkoxy, C_{3-6} cycloalkyl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein

the C_{1-4} alkyl, C_{1-4} alkoxy, C_{3-10} cycloalkyl, C_{3-6} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl-, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^1, R^2, R^3 and R^7 are each optionally substituted with 1 or 2 independently selected R^d substituents;

R^4 is halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4 to 6-membered heterocycloalkyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, phenyl, NH_2, -NHR^8, -NR^8R^8, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5 and R^6 are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5 and R^6 are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered

heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c,

NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$ and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$, $NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$, $NR^gS(O)_2NR^gR^g$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10

membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, phenyl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$ and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-7 membered heterocycloalkyl, C_{6-10} aryl, 5-6 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-6 membered heteroaryl)-C_{1-4} alkyl-, (4-7 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-7 membered heterocycloalkyl, C_{6-10} aryl, 5-6 membered heteroaryl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-6 membered heteroaryl)-C_{1-4} alkyl-, and (4-7 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 5- or 6-membered heteroaryl, 4-6 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$, $NR^kS(O)_2NR^kR^k$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 5- or 6-membered heteroaryl, 4-6 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4}

haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4} alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

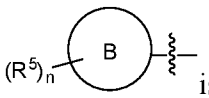
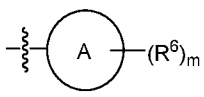
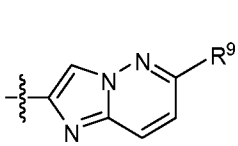
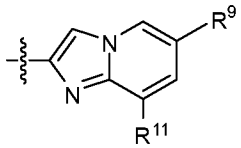
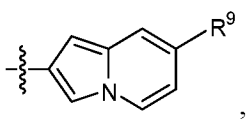
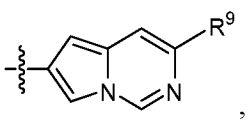
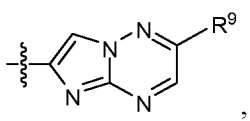
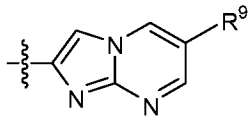
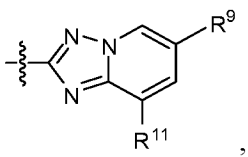
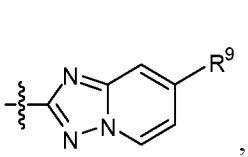
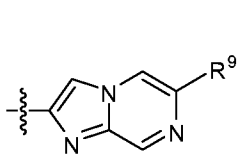
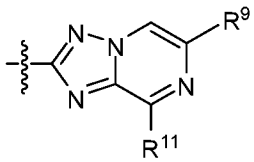
the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

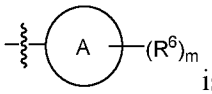
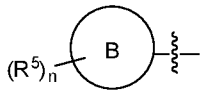
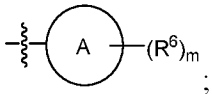
each subscript p is independently an integer of 1, 2, 3 or 4;

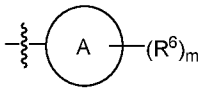
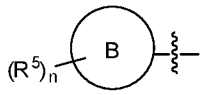
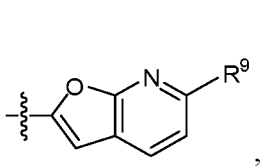
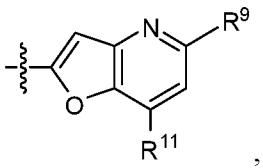
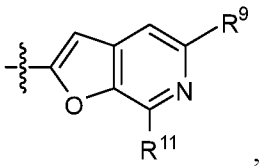
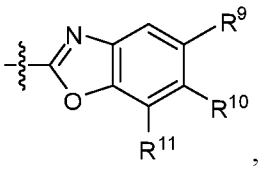
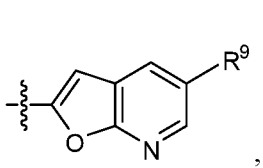
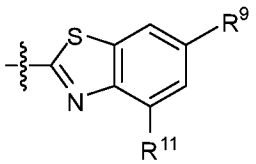
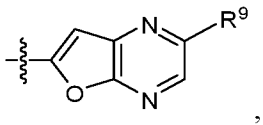
each subscript t is independently an integer of 0, 1, 2, 3 or 4;

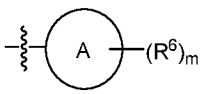
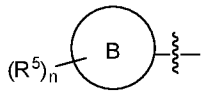
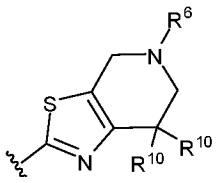
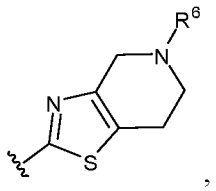
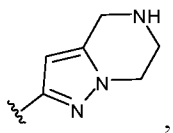
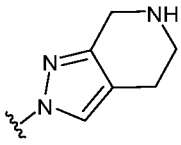
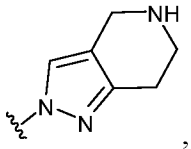
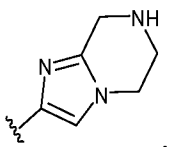
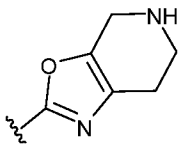
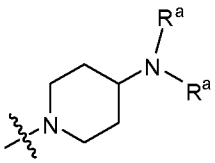
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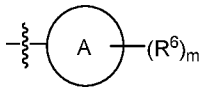
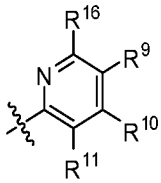
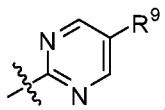
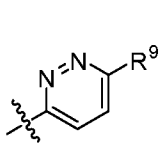
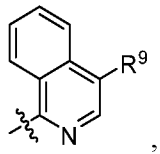
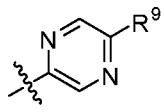
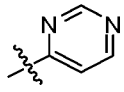
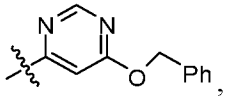
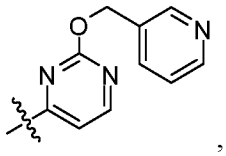
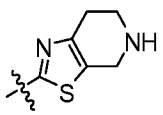
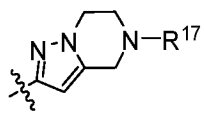
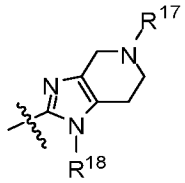
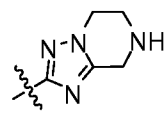
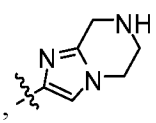
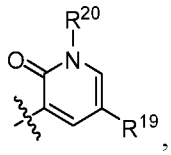
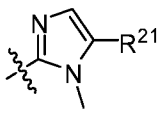
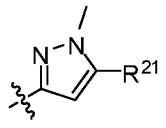
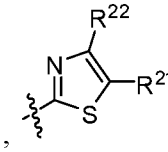
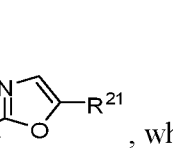
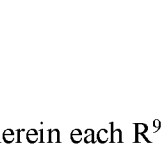
(i) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not , , , , , , , ,  or ,

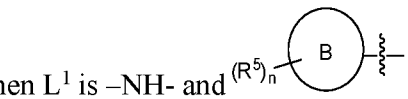
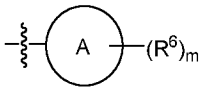
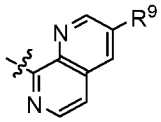
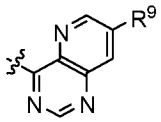
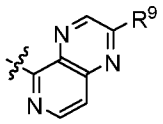
wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl,  is not any of the moieties set forth in proviso (i) above for ;

(iii) when L^1 is a bond, then  or  is not , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  or  is not , , , , , ,  or , wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not , , , , , , , , , , , , , , , , , , , , , , , , wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

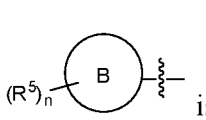
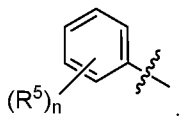
(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

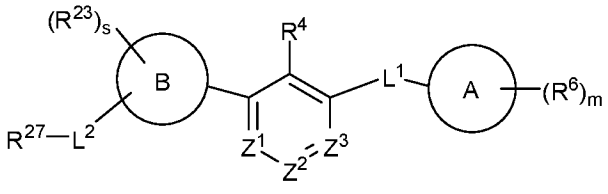
In some embodiments, any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^q substituents.

In some embodiments, provided herein is a compound or a pharmaceutically acceptable salt or a stereoisomer thereof, having an IC_{50} of less than 1 μM in a PD-L1 binding assay. In some embodiments, the compounds as disclosed herein have an IC_{50} of less than 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, 0.1, 0.01, 0.005, 0.004, 0.003, 0.002, or 0.001 μM. For example, the PD-L1 binding assay can be a PD-1/PD-L1 Homogeneous Time-Resolved Fluorescence (HTRF) binding assay as described in Example A. In some embodiments, the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8 and the subscript n is an integer of 1, 2, 3, 4, 5, 6, 7 or 8; or the subscript m is an integer of 1, 2, 3, 4, 5, 6, 7 or 8 and the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8; or the subscripts m and n are each independently an integer of 1, 2, 3, 4, 5, 6, 7 or 8.

In some embodiments,  is .

In some embodiments, provided herein is a compound having Formula (II):



(II)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^2 is a bond, $-(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t-$, O, $-(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-$, $-O(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-(CR^{29}R^{30})_q-$, $-NR^{28}-$, $-(CR^{29}R^{30})_tNR^{28}(CR^{29}R^{30})_t-$, -NH-, $-(CR^{29}R^{30})_tNH(CR^{29}R^{30})_t-$, -CH=CH-, $-C\equiv C-$, $-SO_2-$, $-(CR^{29}R^{30})_tSO_2(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tSO_2NR^{28}(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}SO_2(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}C(O)O(CR^{29}R^{30})_t-$, $-NR^{28}C(O)O-$, $-(CR^{29}R^{30})_tO(CO)NR^{28}(CR^{29}R^{30})_t-$, $-O(CO)NR^{28}-$, $-NR^{28}C(O)NR^{28}-$ or $-(CR^{29}R^{30})_tNR^{28}C(O)NR^{28}(CR^{29}R^{30})_t$;

each R^{23} is independently C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl or $-N(C_{1-4}$ alkyl$)_2$;

R^{27} is C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-11 membered heterocycloalkyl, each of which is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

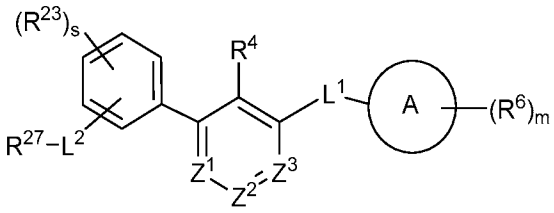
R^{29} and R^{30} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

the subscript s is an integer of 0, 1, 2, 3 or 4; and

each subscript q is independently an integer of 1, 2, 3 or 4.

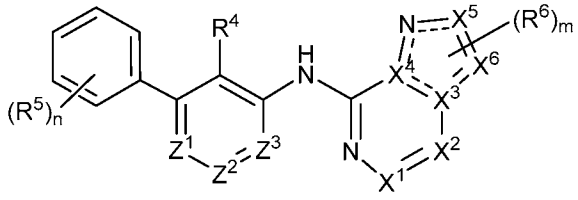
In some embodiments, provided herein is a compound having Formula (IIa):



(IIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof. In some embodiments, Z^1 is CR^1, Z^2 is CR^2 and Z^3 is CR^3.

In some embodiments, provided herein is a compound having Formula (III):



(III)

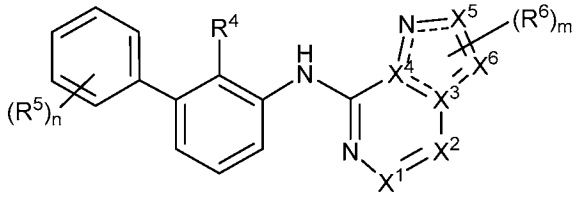
or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4 and X^6 are each independently C or N, with the proviso that no more than two of X^1, X^2, X^3 and X^4 are simultaneously N;

X^5 is C, N, O or S;

==== is a single or a double bond to maintain the fused 5- and 6-membered rings being aromatic.

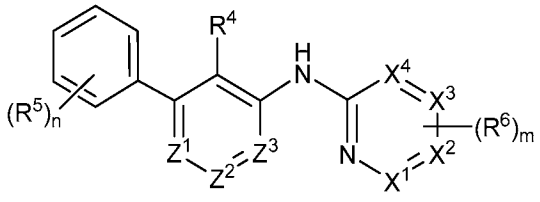
In some embodiments, provided herein is a compound having Formula (IIIa):



(IIIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (IV):

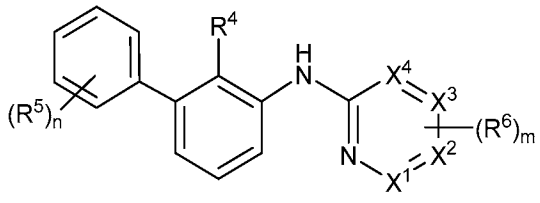


(IV)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3 and X^4 are each independently C or N, with the proviso that no more than two of X^1, X^2, X^3 and X^4 are simultaneously N.

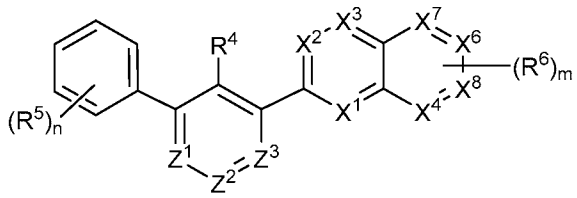
In some embodiments, provided herein is a compound having Formula (IVa):



(IVa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (V):

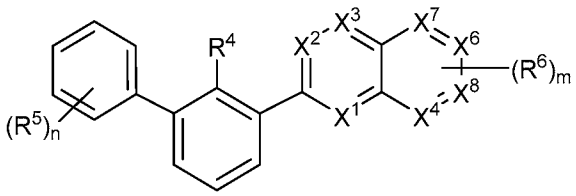


(V)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4, X^6, X^7 and X^8 are each independently C or N, with the proviso that no more than three of X^4, X^6, X^7 and X^8 are simultaneously N.

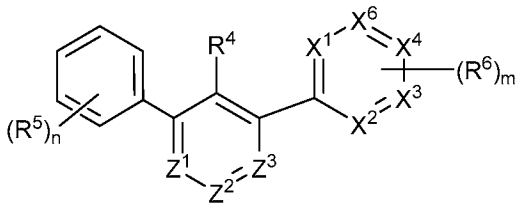
In some embodiments, provided herein is a compound having Formula (Va):



(Va)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (VI):

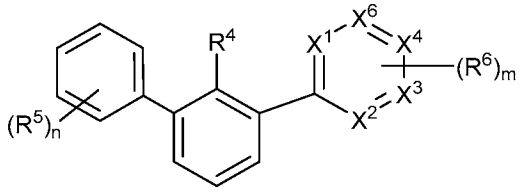


(VI)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4 and X^6 are each independently C or N, with the proviso that no more than three of X^1, X^2, X^3, X^4 and X^6 are simultaneously N.

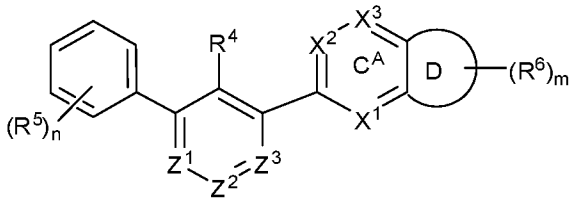
In some embodiments, provided herein is a compound having Formula (VIa):



(VIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (VII):



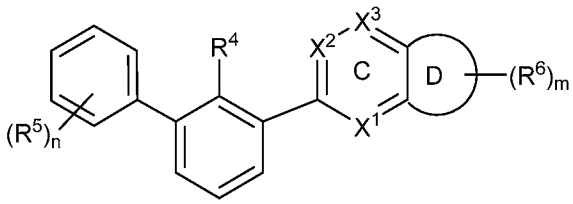
(VII)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2 and X^3 are each independently C or N; and

ring C^A is aromatic and ring D is fused 5- or 6-membered heterocycloalkyl.

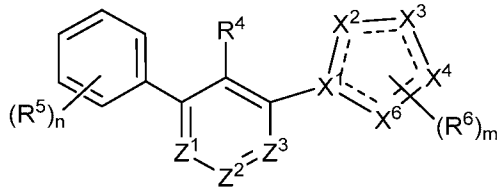
In some embodiments, provided herein is a compound having Formula (VIIa):



(VIIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (VIII):



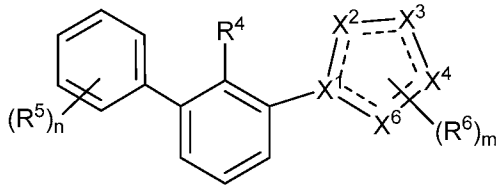
(VIII)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1 is N or C;

X^2, X^3, X^4 and X^6 are each independently C, N, O or to maintain the 5-membered ring A being aromatic.

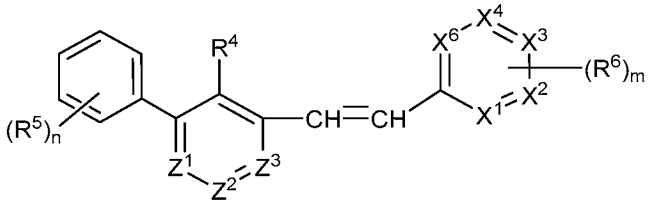
In some embodiments, provided herein is a compound having Formula (VIIIa):



(VIIIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (IX):



(IX)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

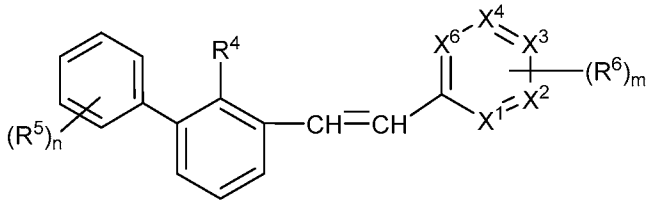
X^1, X^2 and X^3 are each independently C or N;

X^4 is CR^{24} or N;

X^6 is CR^{25} or N;

or R^{24} and R^{25} together with the carbon atoms to which they are attached form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 R^b substituents.

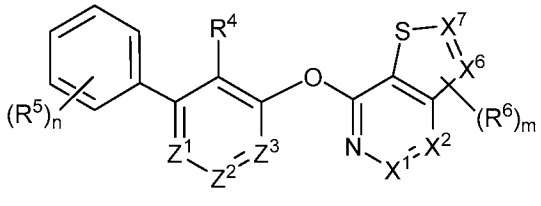
In some embodiments, provided herein is a compound having Formula (IXa):



(IXa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

In some embodiments, provided herein is a compound having Formula (X):

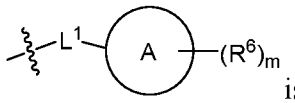


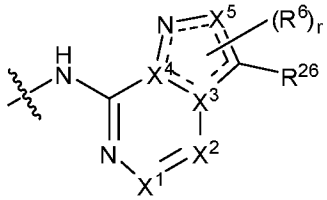
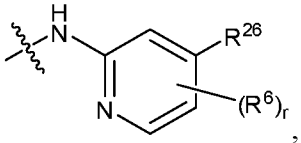
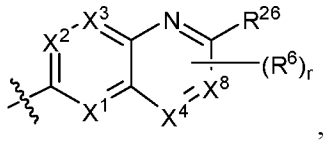
(X)

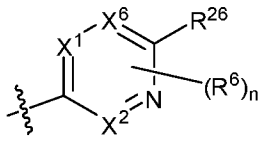
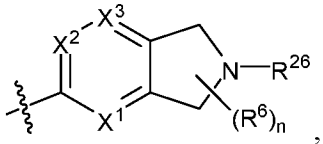
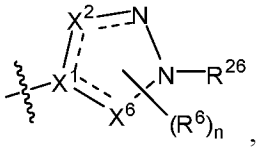
or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

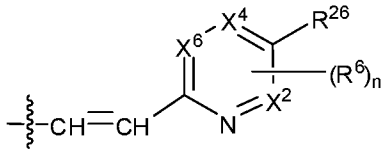
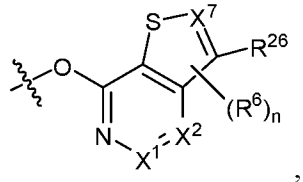
X^1, X^2, X^6 and X^7 are each independently C or N.

In some embodiments, Z^1 is CR^1, Z^2 is CR^2 and Z^3 is CR^3.

In some embodiments,  is selected from:

, , ,

, , ,

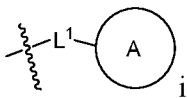
 and , wherein

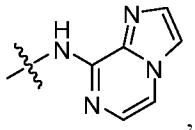
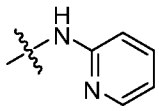
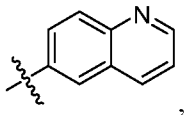
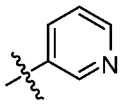
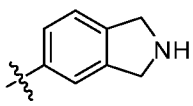
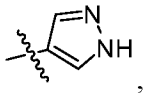
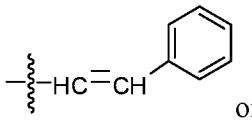
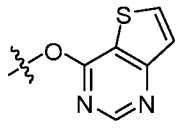
X^1, X^2, X^3, X^4, X^6, X^7 and X^8 are each independently C or N;

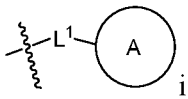
X^5 is C, N, O or S;

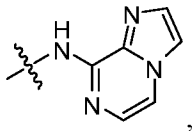
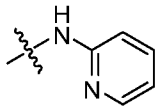
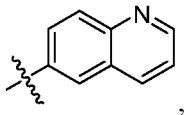
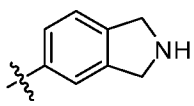
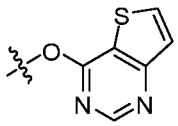
each R^{26} is independently selected from H, halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{26} is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents; and

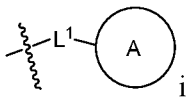
each subscript r is independently an integer of 1, 2, 3, 4, 5, 6 or 7.

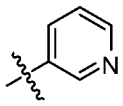
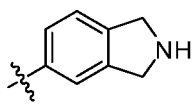
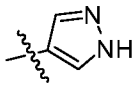
In some embodiments,  is selected from:

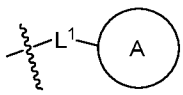







or

, each of which is optionally substituted with 1 to 5 independently selected R^6 substituents.

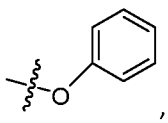
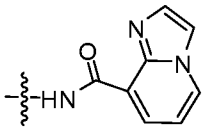
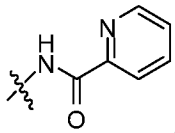
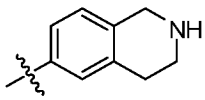
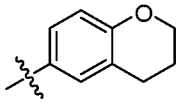
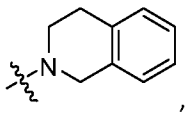
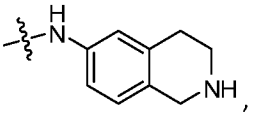
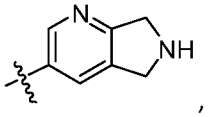
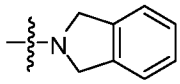
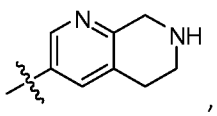
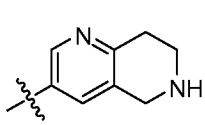
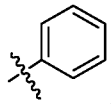
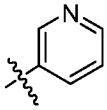
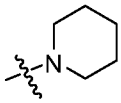
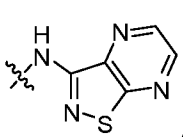
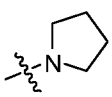
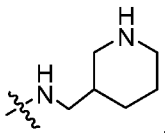
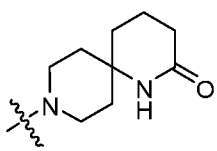
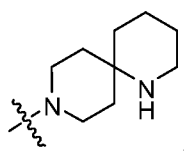
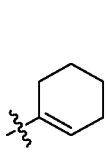
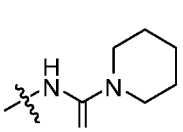
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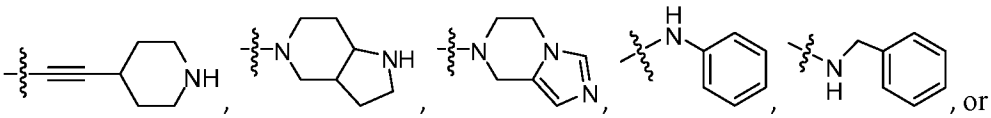




, or

, each of which is optionally substituted with 1 to 5 independently selected R^6 substituents.

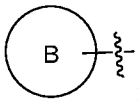
In some embodiments,  is selected from:

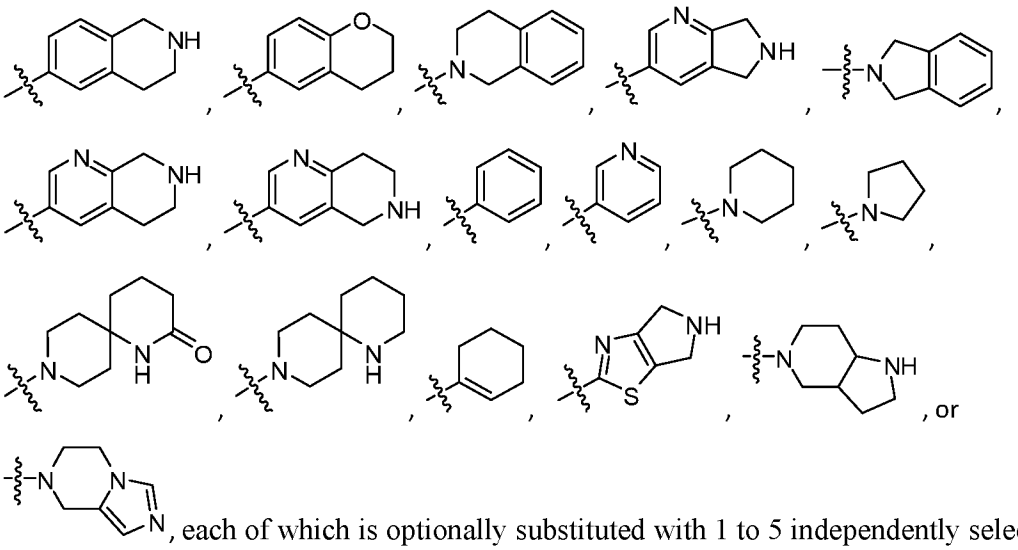


, or

, each of which is optionally substituted with 1 to 5 independently selected R^6 substituents.

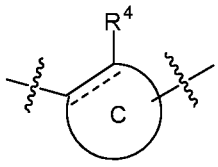
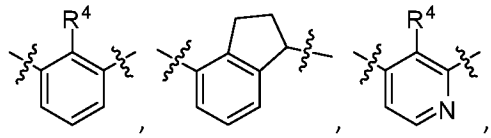
In some embodiments,  is selected from:

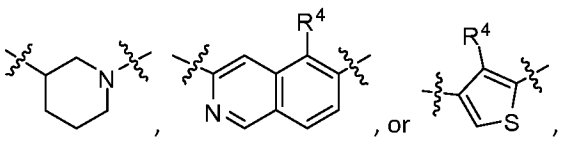























, each of which is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^6 substituents.

In some embodiments, ring B:  is selected from:


, each of which is optionally substituted with 1 to 5 independently selected R^5 substituents.

In some embodiments,  is: 

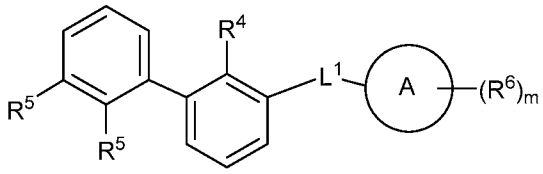

, each of which is optionally substituted with 1, 2 or 3 independently selected R^{31} substituents.

In some embodiments, L^1 is a bond, –O-, -NHC(O)-, -NH-,-CH_2NH-, or –CH_2-.

In some embodiments, L^2 is a bond.

In some embodiments, L^3 is a bond, –O-, -NHC(O)-, -NH-,-CH_2NH-, or –CH_2-.

In some embodiments, provided herein is a compound of Formula (XI):

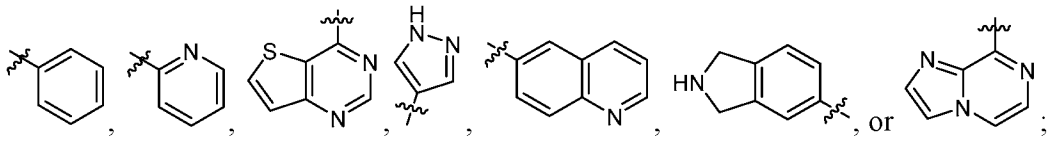


(XI)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, -NR^{13}-, or -CH=CH-;

ring A is



wherein ~~~ indicates the point of attachment of ring A to L^1;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, and $NR^aC(O)OR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2,OR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, and $NR^cC(O)OR^c$;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl R^c are each optionally substituted with 1, 2 or 3 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, and $NR^gC(O)OR^g$;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, and $NR^iC(O)OR^i$;

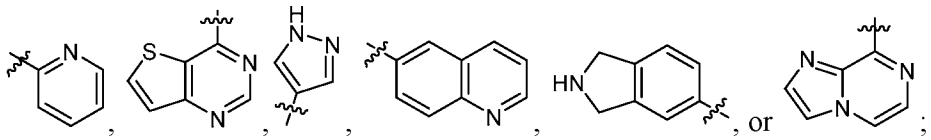
each R^i is independently selected from H, C_{1-6} alkyl, and C_{1-6} haloalkyl; and

the subscript m is an integer of 0, 1, 2, or 3.

In some embodiments, provided herein is a compound of Formula (XI), or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, $-NR^{13}-$, or -CH=CH-;

ring A is



wherein ~~~ indicates the point of attachment of ring A to L^1;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, and $NR^aC(O)OR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered

heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2,OR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, and $NR^cC(O)OR^c$;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl R^c are each optionally substituted with 1, 2 or 3 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, and $NR^gC(O)OR^g$;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, and $NR^iC(O)OR^i$;

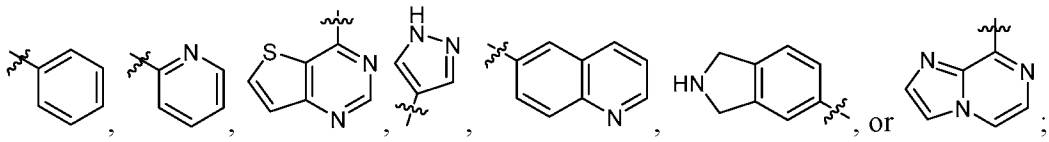
each R^i is independently selected from H, C_{1-6} alkyl, and C_{1-6} haloalkyl; and

the subscript m is an integer of 0, 1, 2, or 3.

In some embodiments, provided herein is a compound of Formula (XI), or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, -NH-, or -CH=CH-;

ring A is



wherein ~~~ indicates the point of attachment of ring A to L^1;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, and OR^a, wherein the C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H and C_{1-6} alkyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $C(O)OR^c$, NHR^c, and NR^cR^c;

each R^c is independently selected from H and C_{1-6} alkyl, wherein the C_{1-6} alkyl is optionally substituted with 1 or 2 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl and OR^g;

each R^g is independently selected from H and C_{1-6} alkyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is $C(O)OR^i$;

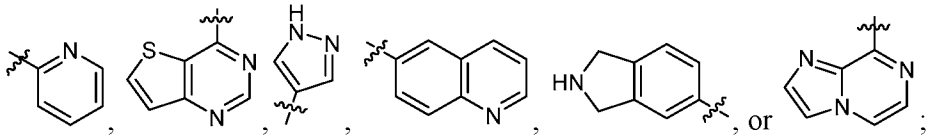
each R^i is independently selected from H and C_{1-6} alkyl; and

the subscript m is an integer of 0, 1, 2, or 3.

In some embodiments, provided herein is a compound of Formula (XI), or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, -NH-, or -CH=CH-;

ring A is



wherein ~~~ indicates the point of attachment of ring A to L^1;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, and OR^a, wherein the C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H and C_{1-6} alkyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $C(O)OR^c$, NHR^c, and NR^cR^c;

each R^c is independently selected from H and C_{1-6} alkyl, wherein the C_{1-6} alkyl is optionally substituted with 1 or 2 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl and OR^g;

each R^g is independently selected from H and C_{1-6} alkyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is $C(O)OR^i$;

each R^i is independently selected from H and C_{1-6} alkyl; and

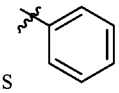
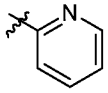
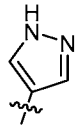
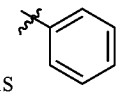
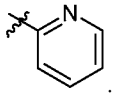
the subscript m is an integer of 0, 1, 2, or 3.

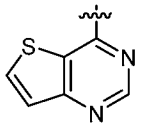
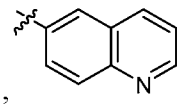
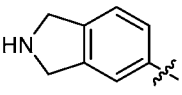
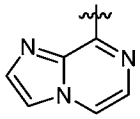
In some embodiments, L is a bond. In some embodiments, L is O. In some embodiments, L is NH. In some embodiments, L is –CH=CH-.

In some embodiments, R^4 is C_{1-6} alkyl. In some embodiments, R^4 is halo.

In some embodiments, R^5 is OR^a. In some embodiments, R^5 is halo.

In some embodiments, each R^6 is independently selected from C_{1-6} alkyl, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1 or 2 independently selected R^b substituents. In some embodiments, each R^6 is 2-hydroxyethylaminomethyl, pyrrolidin-2-ylmethyl, methylpiperidine-2-carboxylic acid, or aminomethyl.

In some embodiments, ring A is , , or . In some embodiments, ring A is . In some embodiments, ring A is .

In some embodiments, ring A is , , , or .

In some embodiments, L^1 is a bond, NH, $-NR^{13}-$, $-CH_2O-$, $-OCH_2-$, $-NR^{13}CH_2-$, $-CH_2NR^{13}-$, $-(CR^{14}R^{15})_p-O-$, $-O(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t-$, $-NR^{13}(CR^{14}R^{15})_t-$,or $-(CR^{14}R^{15})_tNR^{13}-$.

In some embodiments, L^2 is a bond, NH, $-NR^{28}-$, $-CH_2O-$, $-OCH_2-$, $-NR^{28}CH_2-$, $-CH_2NR^{28}-$, $-(CR^{29}R^{30})_p-O-$, $-O(CR^{29}R^{30})_p-$, $-(CR^{29}R^{30})_p-O-(CR^{29}R^{30})_p-$, $-(CR^{29}R^{30})_tNR^{28}(CR^{29}R^{30})_t-$, $-NR^{28}(CR^{29}R^{30})_t-$,or $-(CR^{28}R^{30})_tNR^{28}$.

It is further appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, can also be provided in combination in a single embodiment (while the embodiments are intended to be combined as if written in multiply dependent form). Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, can also be provided separately or in any suitable subcombination. Thus, it is contemplated as features described as embodiments of the compounds of Formula (I) can be combined in any suitable combination.

At various places in the present specification, certain features of the compounds are disclosed in groups or in ranges. It is specifically intended that such a disclosure include each and every individual subcombination of the members of such groups and ranges. For example, the term "C_{1-6} alkyl" is specifically intended to individually disclose (without limitation) methyl, ethyl, C_3 alkyl, C_4 alkyl, C_5 alkyl and C_6 alkyl.

The term "n-membered," where n is an integer, typically describes the number of ring-forming atoms in a moiety where the number of ring-forming atoms is n. For example, piperidinyl is an example of a 6-membered heterocycloalkyl ring, pyrazolyl is an example of a 5-membered heteroaryl ring, pyridyl is an example of a 6-membered heteroaryl ring and 1,2,3,4-tetrahydro-naphthalene is an example of a 10-membered cycloalkyl group.

At various places in the present specification, variables defining divalent linking groups may be described. It is specifically intended that each linking substituent include both the forward and backward forms of the linking substituent. For example, $-NR(CR'R")_n-$ includes both $-NR(CR'R")_n-$ and $-(CR'R")_nNR-$ and is intended to disclose each of the forms individually. Where the structure requires a linking group, the Markush variables listed for that group are understood to be linking groups. For example, if the structure requires a linking group and the Markush group definition for that variable lists "alkyl" or "aryl" then it is understood that the "alkyl" or "aryl" represents a linking alkylene group or arylene group, respectively.

The term "substituted" means that an atom or group of atoms formally replaces hydrogen as a "substituent" attached to another group. The term "substituted", unless otherwise indicated, refers to any level of substitution, *e.g.*, mono-, di-, tri-, tetra- or penta-substitution, where such substitution is permitted. The substituents are independently

selected, and substitution may be at any chemically accessible position. It is to be understood that substitution at a given atom is limited by valency. It is to be understood that substitution at a given atom results in a chemically stable molecule. The phrase "optionally substituted" means unsubstituted or substituted. The term "substituted" means that a hydrogen atom is removed and replaced by a substituent. A single divalent substituent, *e.g.*, oxo, can replace two hydrogen atoms.

The term "C_{n-m}" indicates a range which includes the endpoints, wherein n and m are integers and indicate the number of carbons. Examples include C_{1-4}, C_{1-6} and the like.

The term "alkyl" employed alone or in combination with other terms, refers to a saturated hydrocarbon group that may be straight-chained or branched. The term "C_{n-m} alkyl", refers to an alkyl group having n to m carbon atoms. An alkyl group formally corresponds to an alkane with one C-H bond replaced by the point of attachment of the alkyl group to the remainder of the compound. In some embodiments, the alkyl group contains from 1 to 6 carbon atoms, from 1 to 4 carbon atoms, from 1 to 3 carbon atoms, or 1 to 2 carbon atoms. Examples of alkyl moieties include, but are not limited to, chemical groups such as methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, *tert*-butyl, isobutyl, *sec*-butyl; higher homologs such as 2-methyl-1-butyl, *n*-pentyl, 3-pentyl, *n*-hexyl, 1,2,2-trimethylpropyl and the like.

The term "alkenyl" employed alone or in combination with other terms, refers to a straight-chain or branched hydrocarbon group corresponding to an alkyl group having one or more double carbon-carbon bonds. An alkenyl group formally corresponds to an alkene with one C-H bond replaced by the point of attachment of the alkenyl group to the remainder of the compound. The term "C_{n-m} alkenyl" refers to an alkenyl group having n to m carbons. In some embodiments, the alkenyl moiety contains 2 to 6, 2 to 4, or 2 to 3 carbon atoms. Example alkenyl groups include, but are not limited to, ethenyl, *n*-propenyl, isopropenyl, *n*-butenyl, *sec*-butenyl and the like.

The term "alkynyl" employed alone or in combination with other terms, refers to a straight-chain or branched hydrocarbon group corresponding to an alkyl group having one or more triple carbon-carbon bonds. An alkynyl group formally corresponds to an alkyne with one C-H bond replaced by the point of attachment of the alkyl group to the remainder of the compound. The term "C_{n-m} alkynyl" refers to an alkynyl group having n to m carbons. Example alkynyl groups include, but are not limited to, ethynyl, propyn-1-yl, propyn-2-yl and the like. In some embodiments, the alkynyl moiety contains 2 to 6, 2 to 4, or 2 to 3 carbon atoms.

The term "alkylene", employed alone or in combination with other terms, refers to a divalent alkyl linking group. An alkylene group formally corresponds to an alkane with two C-H bond replaced by points of attachment of the alkylene group to the remainder of the compound. The term "C_{n-m} alkylene" refers to an alkylene group having n to m carbon atoms. Examples of alkylene groups include, but are not limited to, ethan-1,2-diyl, propan-1,3-diyl, propan-1,2-diyl, butan-1,4-diyl, butan-1,3-diyl, butan-1,2-diyl, 2-methyl-propan-1,3-diyl and the like.

The term "alkoxy", employed alone or in combination with other terms, refers to a group of formula -O-alkyl, wherein the alkyl group is as defined above. The term "C_{n-m} alkoxy" refers to an alkoxy group, the alkyl group of which has n to m carbons. Example alkoxy groups include methoxy, ethoxy, propoxy (*e.g.*, *n*-propoxy and isopropoxy), *t*-butoxy and the like. In some embodiments, the alkyl group has 1 to 6, 1 to 4, or 1 to 3 carbon atoms.

The term "amino" refers to a group of formula $-NH_2$.

The term "carbonyl", employed alone or in combination with other terms, refers to a -C(=O)- group, which also may be written as C(O).

The term "cyano" or "nitrile" refers to a group of formula $-C\equiv N$, which also may be written as -CN.

The terms "halo" or "halogen", used alone or in combination with other terms, refers to fluoro, chloro, bromo and iodo. In some embodiments, "halo" refers to a halogen atom selected from F, Cl, or Br. In some embodiments, halo groups are F.

The term "haloalkyl" as used herein refers to an alkyl group in which one or more of the hydrogen atoms has been replaced by a halogen atom. The term "C_{n-m} haloalkyl" refers to a C_{n-m} alkyl group having n to m carbon atoms and from at least one up to {2(n to m)+1} halogen atoms, which may either be the same or different. In some embodiments, the halogen atoms are fluoro atoms. In some embodiments, the haloalkyl group has 1 to 6 or 1 to 4 carbon atoms. Example haloalkyl groups include CF_3, C_2F_5, CHF_2, CCl_3, $CHCl_2$, C_2Cl_5 and the like. In some embodiments, the haloalkyl group is a fluoroalkyl group.

The term "haloalkoxy", employed alone or in combination with other terms, refers to a group of formula -O-haloalkyl, wherein the haloalkyl group is as defined above. The term "C_{n-m} haloalkoxy" refers to a haloalkoxy group, the haloalkyl group of which has n to m carbons. Example haloalkoxy groups include trifluoromethoxy and the like. In some embodiments, the haloalkoxy group has 1 to 6, 1 to 4, or 1 to 3 carbon atoms.

The term "oxo" refers to an oxygen atom as a divalent substituent, forming a carbonyl group when attached to carbon, or attached to a heteroatom forming a sulfoxide or sulfone

group, or an *N*-oxide group. In some embodiments, heterocyclic groups may be optionally substituted by 1 or 2 oxo (=O) substituents.

The term "sulfido" refers to a sulfur atom as a divalent substituent, forming a thiocarbonyl group (C=S) when attached to carbon.

The term "aromatic" refers to a carbocycle or heterocycle having one or more polyunsaturated rings having aromatic character (*i.e.*, having (4n + 2) delocalized π (pi) electrons where n is an integer).

The term "aryl," employed alone or in combination with other terms, refers to an aromatic hydrocarbon group, which may be monocyclic or polycyclic (*e.g.*, having 2 fused rings). The term "C_{n-m} aryl" refers to an aryl group having from n to m ring carbon atoms. Aryl groups include, *e.g.*, phenyl, naphthyl, indanyl, indenyl and the like. Also included in the definition of aryl are moieties that have one or more cycloalkyl or heterocycloalkyl rings fused (i.e., having a bond in common with) to the aryl ring, for example, cyclopentyl, cyclohexyl, azetidinyl, pyrrolidinyl, piperazinyl, or oxazolidinyl fused with phenyl, naphthyl, and the like. An aryl group containing a fused cycloalkyl or heterocycloalkyl ring can be attached through any ring-forming atom, for example, a ring-forming atom of the fused aromatic ringIn some embodiments, aryl groups have from 6 to about 10 ring carbon atoms. In some embodiments aryl groups have 6 carbon atoms. In some embodiments aryl groups have 10 ring carbon atoms. In some embodiments, the aryl group is phenyl. In some embodiments, the aryl group is naphthyl.

The term "heteroaryl" or "heteroaromatic," employed alone or in combination with other terms, refers to a monocyclic or polycyclic aromatic heterocycle having at least one heteroatom ring member selected from sulfur, oxygen and nitrogen. In some embodiments, the heteroaryl ring has 1, 2, 3 or 4 heteroatom ring members independently selected from nitrogen, sulfur and oxygen. In some embodiments, any ring-forming N in a heteroaryl moiety can be an N-oxide. Also included in the definition of heteroaryl are moieties that have one or more cycloalkyl or heterocycloalkyl rings fused (i.e., having a bond in common with) to the heteroaryl ring, for example, cyclobutyl, cyclopentyl, cyclohexyl, azetidinyl, pyrrolidinyl, piperazinyl, or oxazolidinyl fused with pyridyl, thiophenyl, and the like. A heteroaryl group containing a fused cycloalkyl or heterocycloalkyl ring can be attached through any ring-forming atom, for example, a ring-forming atom of the fused heteroaromatic ring. In some embodiments, the heteroaryl has 5-14 ring atoms including carbon atoms and 1, 2, 3 or 4 heteroatom ring members independently selected from

nitrogen, sulfur and oxygen. In some embodiments, the heteroaryl has 5-14, or 5-10 ring atoms including carbon atoms and 1, 2, 3 or 4 heteroatom ring members independently selected from nitrogen, sulfur and oxygen. In some embodiments, the heteroaryl has 5-6 ring atoms and 1 or 2 heteroatom ring members independently selected from nitrogen, sulfur and oxygen. In some embodiments, the heteroaryl is a five-membered or six-membered heteroaryl ring. In other embodiments, the heteroaryl is an eight-membered, nine-membered or ten-membered fused bicyclic heteroaryl ring. Example heteroaryl groups include, but are not limited to, pyridinyl (pyridyl), pyrimidinyl, pyrazinyl, pyridazinyl, pyrrolyl, pyrazolyl, azolyl, oxazolyl, thiazolyl, imidazolyl, furanyl, thiophenyl, quinolinyl, isoquinolinyl, naphthyridinyl (including 1,2-, 1,3-, 1,4-, 1,5-, 1,6-, 1,7-, 1,8-, 2,3- and 2,6-naphthyridine), indolyl, benzothiophenyl, benzofuranyl, benzisoxazolyl, imidazo[1,2-*b*]thiazolyl, purinyl, thienopyrimidinyl (e.g., thieno[3,2-d]pyrimidin-7-yl), imidazopyrazinyl (e.g., imidazo[1,2-a]pyrazin-3-yl) and the like.

A five-membered heteroaryl ring is a heteroaryl group having five ring atoms wherein one or more (*e.g.*, 1, 2 or 3) ring atoms are independently selected from N, O and S. Exemplary five-membered ring heteroaryls include thienyl, furyl, pyrrolyl, imidazolyl, thiazolyl, oxazolyl, pyrazolyl, isothiazolyl, isoxazolyl, 1,2,3-triazolyl, tetrazolyl, 1,2,3-thiadiazolyl, 1,2,3-oxadiazolyl, 1,2,4-triazolyl, 1,2,4-thiadiazolyl, 1,2,4-oxadiazolyl, 1,3,4-triazolyl, 1,3,4-thiadiazolyl and 1,3,4-oxadiazolyl.

A six-membered heteroaryl ring is a heteroaryl group having six ring atoms wherein one or more (*e.g.*, 1, 2 or 3) ring atoms are independently selected from N, O and S. Exemplary six-membered ring heteroaryls are pyridyl, pyrazinyl, pyrimidinyl, triazinyl and pyridazinyl.

The term "cycloalkyl," employed alone or in combination with other terms, refers to a non-aromatic hydrocarbon ring system (monocyclic, bicyclic or polycyclic), including cyclized alkyl and alkenyl groups. The term "C_{n-m} cycloalkyl" refers to a cycloalkyl that has n to m ring member carbon atoms. Cycloalkyl groups can include mono- or polycyclic (*e.g.*, having 2, 3 or 4 fused rings) groups and spirocycles. Cycloalkyl groups can have 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, or 14 ring-forming carbons (C_{3-14}). In some embodiments, the cycloalkyl group has 3 to 14 members, 3 to 10 members, 3 to 6 ring members, 3 to 5 ring members, or 3 to 4 ring members. In some embodiments, the cycloalkyl group is monocyclic. In some embodiments, the cycloalkyl group is monocyclic or bicyclic. In some embodiments, the cycloalkyl group is a C_{3-6} monocyclic cycloalkyl group. Ring-forming carbon atoms of a cycloalkyl group can be optionally oxidized to form an oxo or sulfido group. Cycloalkyl

groups also include cycloalkylidenes. In some embodiments, cycloalkyl is cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl. Also included in the definition of cycloalkyl are moieties that have one or more aromatic rings fused (*i.e.*, having a bond in common with) to the cycloalkyl ring, *e.g.*, benzo or thienyl derivatives of cyclopentane, cyclohexane and the like. A cycloalkyl group containing a fused aromatic ring can be attached through any ring-forming atom, for example, a ring-forming atom of the cycloalkyl ring. Examples of cycloalkyl groups include cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclopentenyl, cyclohexenyl, cyclohexadienyl, cycloheptatrienyl, norbornyl, norpinyl, norcarnyl, bicyclo[1.1.1]pentanyl, bicyclo[2.1.1]hexanyl, and the like. In some embodiments, the cycloalkyl group is cyclopropyl, cyclobutyl, cyclopentyl, or cyclohexyl.

The term "heterocycloalkyl," employed alone or in combination with other terms, refers to a non-aromatic ring or ring system, which may optionally contain one or more alkenylene groups as part of the ring structure, which has at least one heteroatom ring member independently selected from nitrogen, sulfur oxygen and phosphorus, and which has 4-14 ring members, 4-10 ring members, 4-7 ring members, or 4-6 ring members. Included within the term "heterocycloalkyl" are monocyclic 4-, 5-, 6- and 7-membered heterocycloalkyl groups. Heterocycloalkyl groups can include mono- or bicyclic or polycyclic (*e.g.*, having two or three fused or bridged rings) ring systems or spirorcycles. In some embodiments, the heterocycloalkyl group is a monocyclic group having 1, 2 or 3 heteroatoms independently selected from nitrogen, sulfur and oxygen. Ring-forming carbon atoms and heteroatoms of a heterocycloalkyl group can be optionally oxidized to form an oxo or sulfido group or other oxidized linkage (*e.g.*, C(O), S(O), C(S) or $S(O)_2$, *N*-oxide, *etc.*) or a nitrogen atom can be quaternized. The heterocycloalkyl group can be attached through a ring-forming carbon atom or a ring-forming heteroatom. In some embodiments, the heterocycloalkyl group contains 0 to 3 double bonds. In some embodiments, the heterocycloalkyl group contains 0 to 2 double bonds. Also included in the definition of heterocycloalkyl are moieties that have one or more aromatic rings fused (*i.e.*, having a bond in common with) to the heterocycloalkyl ring, *e.g.*, benzo or thienyl derivatives of piperidine, morpholine, azepine, *etc.* A heterocycloalkyl group containing a fused aromatic ring can be attached through any ring-forming atom including a ring-forming atom of the fused aromatic ring. Examples of heterocycloalkyl groups include azetidinyl, azepanyl, dihydrobenzofuranyl, dihydrofuranyl, dihydropyranyl, morpholino, 3-oxa-9-azaspiro[5.5]undecanyl, 1-oxa-8-azaspiro[4.5]decanyl, piperidinyl, piperazinyl,

oxopiperazinyl, pyranyl, pyrrolidinyl, quinuclidinyl, tetrahydrofuranyl, tetrahydropyranyl, 1,2,3,4-tetrahydroquinolinyl, tropanyl, isoindolinyl, and thiomorpholino.

At certain places, the definitions or embodiments refer to specific rings (*e.g.*, an azetidine ring, a pyridine ring, *etc.*). Unless otherwise indicated, these rings can be attached to any ring member provided that the valency of the atom is not exceeded. For example, an azetidine ring may be attached at any position of the ring, whereas an azetidin-3-yl ring is attached at the 3-position.

The compounds described herein can be asymmetric (*e.g.*, having one or more stereocenters). All stereoisomers, such as enantiomers and diastereomers, are intended unless otherwise indicated. Compounds of the present invention that contain asymmetrically substituted carbon atoms can be isolated in optically active or racemic forms. Methods on how to prepare optically active forms from optically inactive starting materials are known in the art, such as by resolution of racemic mixtures or by stereoselective synthesis. Many geometric isomers of olefins, C=N double bonds and the like can also be present in the compounds described herein, and all such stable isomers are contemplated in the present invention. *Cis* and *trans* geometric isomers of the compounds of the present invention are described and may be isolated as a mixture of isomers or as separated isomeric forms.

Resolution of racemic mixtures of compounds can be carried out by any of numerous methods known in the art. One method includes fractional recrystallization using a chiral resolving acid which is an optically active, salt-forming organic acid. Suitable resolving agents for fractional recrystallization methods are, *e.g.*, optically active acids, such as the D and L forms of tartaric acid, diacetyltartaric acid, dibenzoyltartaric acid, mandelic acid, malic acid, lactic acid or the various optically active camphorsulfonic acids such as β-camphorsulfonic acid. Other resolving agents suitable for fractional crystallization methods include stereoisomerically pure forms of α-methylbenzylamine (*e.g.*, *S* and *R* forms, or diastereomerically pure forms), 2-phenylglycinol, norephedrine, ephedrine, *N*-methylephedrine, cyclohexylethylamine, 1,2-diaminocyclohexane and the like.

Resolution of racemic mixtures can also be carried out by elution on a column packed with an optically active resolving agent (*e.g.*, dinitrobenzoylphenylglycine). Suitable elution solvent composition can be determined by one skilled in the art.

In some embodiments, the compounds of the invention have the (*R*)-configuration. In other embodiments, the compounds have the (*S*)-configuration. In compounds with more

than one chiral centers, each of the chiral centers in the compound may be independently (*R*) or (*S*), unless otherwise indicated.

Compounds of the invention also include tautomeric forms. Tautomeric forms result from the swapping of a single bond with an adjacent double bond together with the concomitant migration of a proton. Tautomeric forms include prototropic tautomers which are isomeric protonation states having the same empirical formula and total charge. Example prototropic tautomers include ketone – enol pairs, amide - imidic acid pairs, lactam – lactim pairs, enamine – imine pairs, and annular forms where a proton can occupy two or more positions of a heterocyclic system, *e.g.*, 1*H*- and 3*H*-imidazole, 1*H*-, 2*H*- and 4*H*- 1,2,4-triazole, 1*H*- and 2*H*- isoindole and 1*H*- and 2*H*-pyrazole. Tautomeric forms can be in equilibrium or sterically locked into one form by appropriate substitution.

Compounds of the invention can also include all isotopes of atoms occurring in the intermediates or final compounds. Isotopes include those atoms having the same atomic number but different mass numbers. For example, isotopes of hydrogen include tritium and deuterium. One or more constituent atoms of the compounds of the invention can be replaced or substituted with isotopes of the atoms in natural or non-natural abundance. In some embodiments, the compound includes at least one deuterium atom. For example, one or more hydrogen atoms in a compound of the present disclosure can be replaced or substituted by deuterium. In some embodiments, the compound includes two or more deuterium atoms. In some embodiments, the compound includes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 deuterium atoms. Synthetic methods for including isotopes into organic compounds are known in the art.

The term, "compound," as used herein is meant to include all stereoisomers, geometric isomers, tautomers and isotopes of the structures depicted. The term is also meant to refer to compounds of the inventions, regardless of how they are prepared, e.g., synthetically, through biological process (e.g., metabolism or enzyme conversion), or a combination thereof.

All compounds, and pharmaceutically acceptable salts thereof, can be found together with other substances such as water and solvents (*e.g.*, hydrates and solvates) or can be isolated. When in the solid state, the compounds described herein and salts thereof may occur in various forms and may, *e.g.*, take the form of solvates, including hydrates. The compounds may be in any solid state form, such as a polymorph or solvate, so unless clearly indicated otherwise, reference in the specification to compounds and salts thereof should be understood as encompassing any solid state form of the compound.

In some embodiments, the compounds of the invention, or salts thereof, are substantially isolated. By "substantially isolated" is meant that the compound is at least partially or substantially separated from the environment in which it was formed or detected. Partial separation can include, *e.g.*, a composition enriched in the compounds of the invention. Substantial separation can include compositions containing at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 95%, at least about 97%, or at least about 99% by weight of the compounds of the invention, or salt thereof.

The phrase "pharmaceutically acceptable" is employed herein to refer to those compounds, materials, compositions and/or dosage forms which are, within the scope of sound medical judgment, suitable for use in contact with the tissues of human beings and animals without excessive toxicity, irritation, allergic response, or other problem or complication, commensurate with a reasonable benefit/risk ratio.

The expressions, "ambient temperature" and "room temperature," as used herein, are understood in the art, and refer generally to a temperature, *e.g.*, a reaction temperature, that is about the temperature of the room in which the reaction is carried out, *e.g.*, a temperature from about 20 °C to about 30 °C.

The present invention also includes pharmaceutically acceptable salts of the compounds described herein. The term "pharmaceutically acceptable salts" refers to derivatives of the disclosed compounds wherein the parent compound is modified by converting an existing acid or base moiety to its salt form. Examples of pharmaceutically acceptable salts include, but are not limited to, mineral or organic acid salts of basic residues such as amines; alkali or organic salts of acidic residues such as carboxylic acids; and the like. The pharmaceutically acceptable salts of the present invention include the non-toxic salts of the parent compound formed, *e.g.*, from non-toxic inorganic or organic acids. The pharmaceutically acceptable salts of the present invention can be synthesized from the parent compound which contains a basic or acidic moiety by conventional chemical methods. Generally, such salts can be prepared by reacting the free acid or base forms of these compounds with a stoichiometric amount of the appropriate base or acid in water or in an organic solvent, or in a mixture of the two; generally, non-aqueous media like ether, ethyl acetate, alcohols (*e.g.*, methanol, ethanol, iso-propanol or butanol) or acetonitrile (MeCN) are preferred. Lists of suitable salts are found in *Remington's Pharmaceutical Sciences*, 17th Ed., (Mack Publishing Company, Easton, 1985), p. 1418, Berge *et al.*, *J. Pharm. Sci.*, **1977**, *66*(1), 1-19 and in Stahl *et al.*, *Handbook of Pharmaceutical Salts: Properties, Selection, and*

Use, (Wiley, 2002). In some embodiments, the compounds described herein include the N-oxide forms.

II. Synthesis

Compounds of the invention, including salts thereof, can be prepared using known organic synthesis techniques and can be synthesized according to any of numerous possible synthetic routes, such as those in the Schemes below.

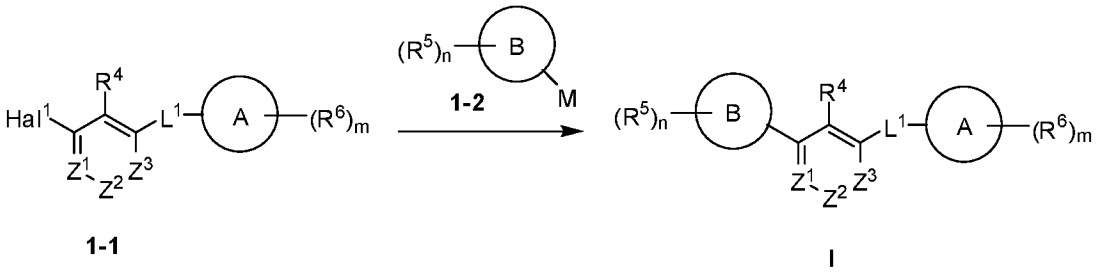
The reactions for preparing compounds of the invention can be carried out in suitable solvents which can be readily selected by one of skill in the art of organic synthesis. Suitable solvents can be substantially non-reactive with the starting materials (reactants), the intermediates or products at the temperatures at which the reactions are carried out, *e.g.*, temperatures which can range from the solvent's freezing temperature to the solvent's boiling temperature. A given reaction can be carried out in one solvent or a mixture of more than one solvent. Depending on the particular reaction step, suitable solvents for a particular reaction step can be selected by the skilled artisan.

Preparation of compounds of the invention can involve the protection and deprotection of various chemical groups. The need for protection and deprotection, and the selection of appropriate protecting groups, can be readily determined by one skilled in the art. The chemistry of protecting groups is described, *e.g.*, in Kocienski, *Protecting Groups*, (Thieme, 2007); Robertson, *Protecting Group Chemistry*, (Oxford University Press, 2000); Smith *et al.*, *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure*, 6th Ed. (Wiley, 2007); Peturssion *et al.*, "Protecting Groups in Carbohydrate Chemistry," *J. Chem. Educ.*, 1997, *74*(11), 1297; and Wuts *et al.*, *Protective Groups in Organic Synthesis*, 4th Ed., (Wiley, 2006).

Reactions can be monitored according to any suitable method known in the art. For example, product formation can be monitored by spectroscopic means, such as nuclear magnetic resonance spectroscopy (*e.g.*, ^{1}H or ^{13}C), infrared spectroscopy, spectrophotometry (*e.g.*, UV-visible), mass spectrometry or by chromatographic methods such as high performance liquid chromatography (HPLC) or thin layer chromatography (TLC).

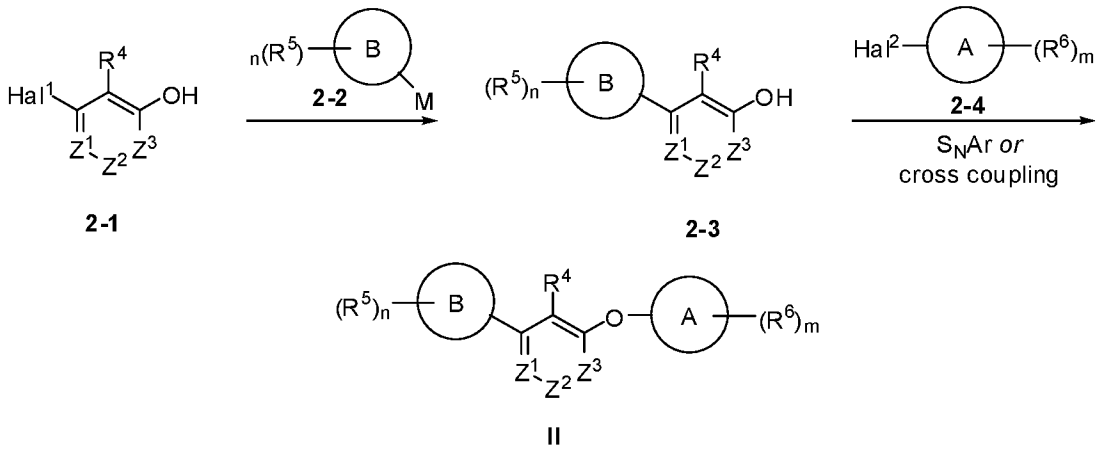
The Schemes below provide general guidance in connection with preparing the compounds of the invention. One skilled in the art would understand that the preparations shown in the Schemes can be modified or optimized using general knowledge of organic chemistry to prepare various compounds of the invention.

Compounds of Formula **I** can be synthesized using a process shown in **Scheme 1**. In **Scheme 1**, a suitable halo (Hal^1)-substituted arene **1-1** can react with a coupling reagent **1-2** (where M is, *e.g.*, $-B(OR)_2$) to provide the product of formula **I** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)).



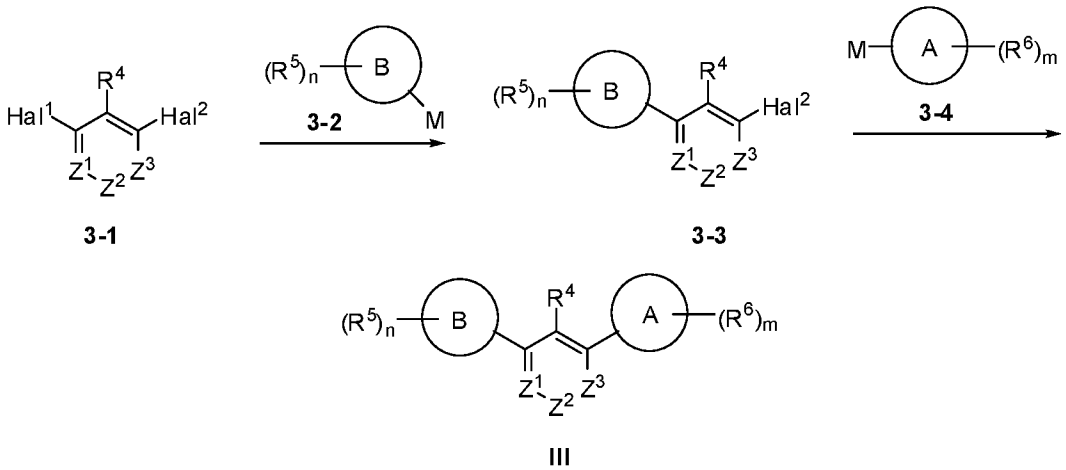
Scheme 1

Compounds of formula **II** can be synthesized using a process shown in **Scheme 2**. In **Scheme 2**, a suitable halo (Hal^1)-substituted phenol **2-1** can react with a coupling reagent **2-2** (where M is, *e.g.*, $-B(OR)_2$) to provide the product of formula **2-3** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)). Then phenol **2-3** can react with a suitable halo (Hal^2)-substituted heterocycle **2-4** under S_NAr conditions using a base such as, but not limited to, potassium carbonate, to provide the compound of formula **II**. Compounds of formula **II** may also be obtained by cross-coupling conditions in the presence of a transition metal catalyst-ligand system ((*e.g.*, copper iodide with 3,4,7,8-tetramethyl-1,10-phenanthroline,), and a base (*e.g.*, potassium phosphate).



Scheme 2

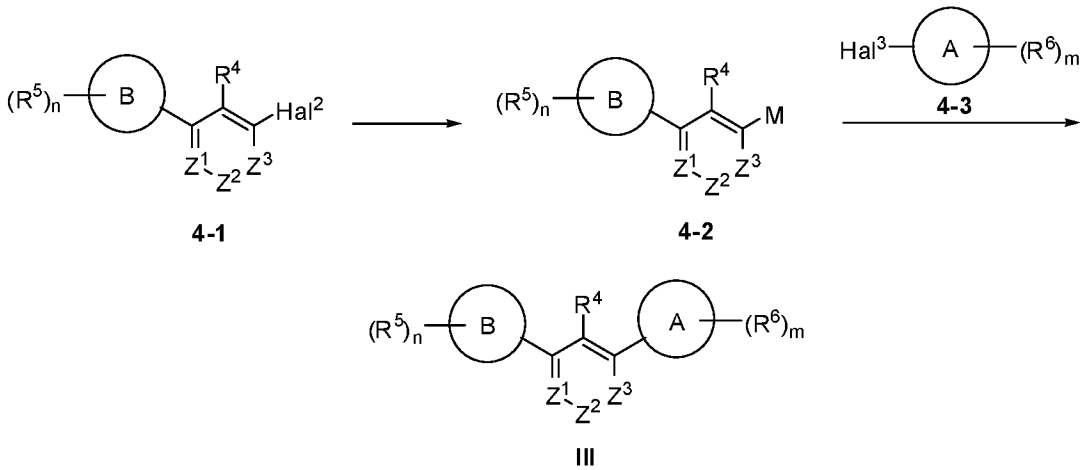
Compounds of formula **III** can be can be synthesized using a process shown in **Scheme 3**. In **Scheme 3**, a suitable di-halo (Hal^1, Hal^2)-substituted arene **3-1** (where Hal^1 is more reactive than Hal^2) can react with a coupling reagent **3-2** (where M is, *e.g.*, $-B(OR)_2$) to provide the product of formula **3-3** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)). Then the aromatic halide **3-3** can react with a coupling reagent **3-4** (where M is, *e.g.*, $-B(OR)_2$) to provide the product of formula **III** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)).



Scheme 3

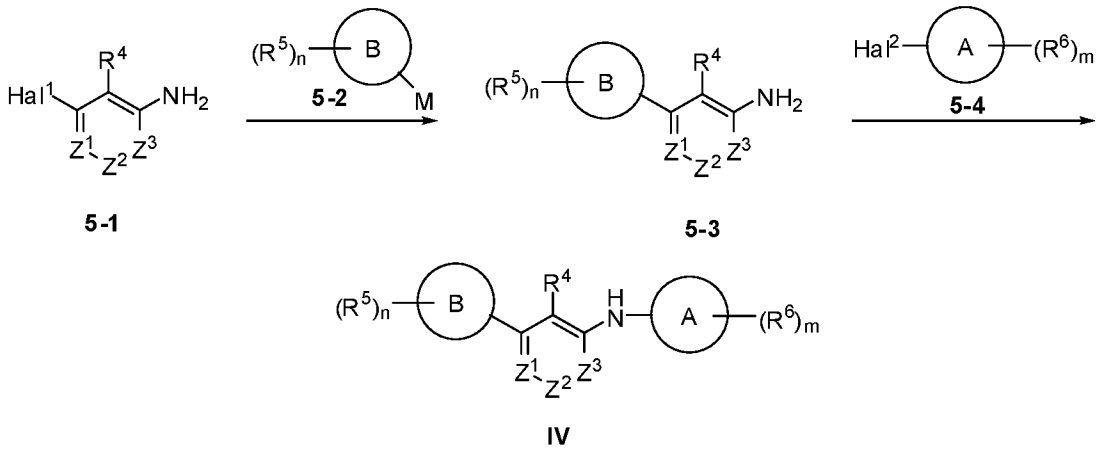
Compounds of formula **III** can alternatively be synthesized using a process shown in **Scheme 4**. A suitable halo (Hal^2)-substituted arene **4-1** can be converted to a cross coupling

reagent of formula **4-2** using cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)), bis(pinacolato)diboron, and a base (*e.g.*, potassium acetate)). Alternatively, compounds of formula **4-2** may be prepared through lithium halogen exchange of halo (Hal^2)-substituted arene **4-1**, followed by transmetalation (*e.g.*, reacting with trimethyl borate and quenching to provide M as $-B(OH)_2$). Cross coupling reagent **4-2** can react with a suitable halo (Hal^3)-substitued heterocycle **4-3** to produce compounds of formula **III**.



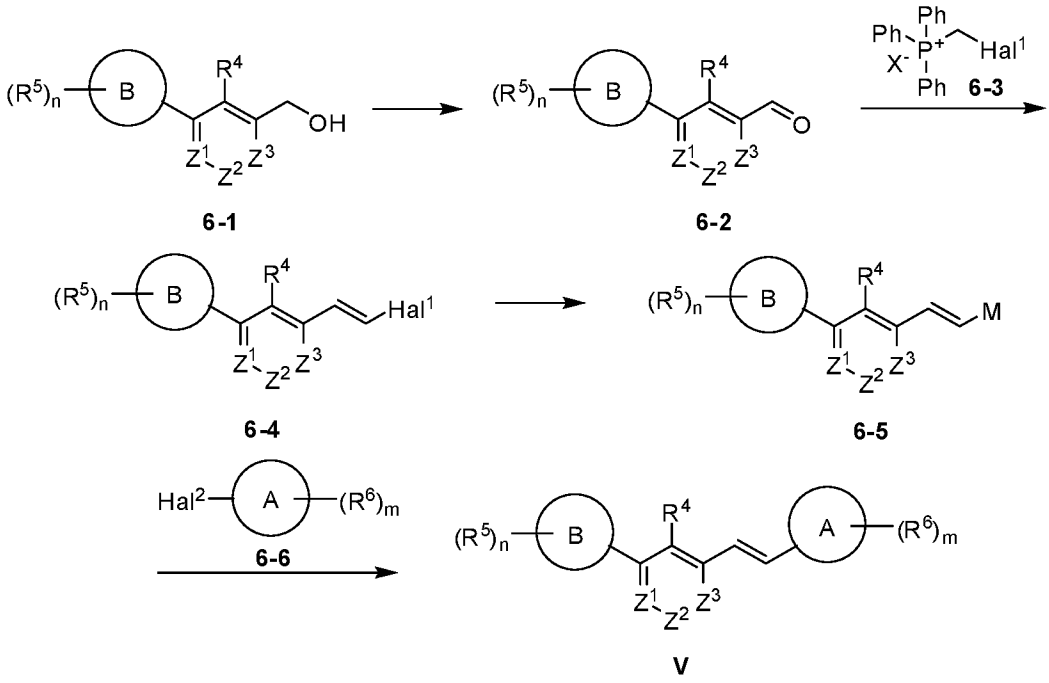
Scheme 4

Compounds of formula **IV** can be synthesized using a process shown in **Scheme 5**. A suitable halo (Hal^1)-substituted aniline **5-1** can react with a coupling reagent **5-2** (where M is, *e.g.*, $-B(OR)_2$) to provide the product of formula **5-3** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)). A suitable halo (Hal^2)-substituted heterocycle **5-4** can react with aniline **5-3** to produce compounds of formula **IV** under S_NAr conditions using an acid such as, but not limited to, sulfuric acid, or base such as, but not limited to, potassium *tert*-butoxide. Compounds of formula **IV** may also be synthesized under standard metal catalyzed cross-coupling reaction conditions (such as Buchwald–Hartwig coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [(4,5-bis(diphenylphosphino)-9,9-dimethylxanthene)-2-(2′-amino-1,1′-biphenyl)]palladium(II) methanesulfonate) and a base (*e.g.*, cesium carbonate)).



Scheme 5

Compounds of formula **V** can be synthesized using a process shown in **Scheme 6**. A suitable benzylic alcohol **6-1** can be oxidized to an aldehyde of formula **6-2** using reagents such as, but not limited to, Dess–Martin periodinane. A compound of formula **6-2** may then be reacted with a suitable suitable halo (Hal^1)-substituted Wittig salt **6-3** (where X^- is, *e.g.*, Br^-) under standard Wittig conditions using a base such as, but not limited to, potassium *tert*-butoxide, to provide a compound of formula **6-4**. Compounds of formula **6-4** can be converted to a cross coupling reagent of formula **6-5** using cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)), bis(pinacolato)diboron, and a base (*e.g.*, potassium acetate)). Alternatively, compounds of formula **6-5** may be prepared through lithium halogen exchange of halo (Hal^1)-substituted arene **6-4**, followed by transmetalation (*e.g.*, reacting with trimethyl borate and quenching to provide M as $-B(OH)_2$). Cross coupling reagent **6-5** can react with a suitable halo (Hal^2)-substitued heterocycle **6-6** to produce compounds of formula **V** under standard metal catalyzed cross-coupling reaction conditions (such as Suzuki coupling reaction, *e.g.*, in the presence of a palladium catalyst (*e.g.*, [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II)) and a base (*e.g.*, a bicarbonate or a carbonate base)).



Scheme 6

III. Uses of the Compounds

Compounds of the present disclosure can inhibit the activity of PD-1/PD-L1 protein/protein interaction and, thus, are useful in treating diseases and disorders associated with activity of PD-1 and the diseases and disorders associated with PD-L1 including its interaction with other proteins such as PD-1 and B7-1 (CD80). Advantageously, the compounds of the present disclosure demonstrate better efficacy and favorable safety and toxicity profiles in animal studies. In certain embodiments, the compounds of the present disclosure, or pharmaceutically acceptable salts or stereoisomers thereof, are useful for therapeutic administration to enhance, stimulate and/or increase immunity in cancer, chronic infection or sepsis, including enhancement of response to vaccination. In some embodiments, the present disclosure provides a method for inhibiting or blocking the PD-1/PD-L1 protein/protein interaction. The method includes administering to an individual or a patient a compound of Formula (I) or any of the formulas as described herein or of a compound as recited in any of the claims and described herein, or a pharmaceutically acceptable salt or a stereoisomer thereof. The compounds of the present disclosure can be used alone, in combination with other agents or therapies or as an adjuvant or neoadjuvant for the treatment of diseases or disorders, including cancer or infection diseases. For the uses

described herein, any of the compounds of the disclosure, including any of the embodiments thereof, may be used.

The compounds of the present disclosure inhibit the PD-1/PD-L1 protein/protein interaction, resulting in a PD-1 pathway blockade. The blockade of PD-1 can enhance the immune response to cancerous cells and infectious diseases in mammals, including humans. In some embodiments, the present disclosure provides treatment of an individual or a patient *in vivo* using a compound of Formula (I) or a salt or stereoisomer thereof such that growth of cancerous tumors is inhibited. A compound of Formula (I) or of any of the formulas as described herein, or a compound as recited in any of the claims and described herein, or a salt or stereoisomer thereof, can be used to inhibit the growth of cancerous tumors. Alternatively, a compound of Formula (I) or of any of the formulas as described herein, or a compound as recited in any of the claims and described herein, or a salt or stereoisomer thereof, can be used in conjunction with other agents or standard cancer treatments, as described below. In one embodiment, the present disclosure provides a method for inhibiting growth of tumor cells *in vitro*. The method includes contacting the tumor cells *in vitro* with a compound of Formula (I) or of any of the formulas as described herein, or of a compound as recited in any of the claims and described herein, or of a salt or stereoisomer thereof. In another embodiment, the present disclosure provides a method for inhibiting growth of tumor cells in an individual or a patient. The method includes administering to the individual or patient in need thereof a therapeutically effective amount of a compound of Formula (I) or of any of the formulas as described herein, or of a compound as recited in any of the claims and described herein, or a salt or a stereoisomer thereof.

In some embodiments, provided herein is a method for treating cancer. The method includes administering to a patient in need thereof, a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a salt thereof. Examples of cancers include those whose growth may be inhibited using compounds of the disclosure and cancers typically responsive to immunotherapy.

In some embodiments, the present disclosure provides a method of enhancing, stimulating and/or increasing the immune response in a patient. The method includes administering to the patient in need thereof a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a salt thereof.

Examples of cancers that are treatable using the compounds of the present disclosure

include, but are not limited to, bone cancer, pancreatic cancer, skin cancer, cancer of the head or neck, cutaneous or intraocular malignant melanoma, uterine cancer, ovarian cancer, rectal cancer, cancer of the anal region, stomach cancer, testicular cancer, uterine cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, endometrial cancer, carcinoma of the cervix, carcinoma of the vagina, carcinoma of the vulva, Hodgkin's Disease, non-Hodgkin's lymphoma, cancer of the esophagus, cancer of the small intestine, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, sarcoma of soft tissue, cancer of the urethra, cancer of the penis, chronic or acute leukemias including acute myeloid leukemia, chronic myeloid leukemia, acute lymphoblastic leukemia, chronic lymphocytic leukemia, solid tumors of childhood, lymphocytic lymphoma, cancer of the bladder, cancer of the kidney or urethra, carcinoma of the renal pelvis, neoplasm of the central nervous system (CNS), primary CNS lymphoma, tumor angiogenesis, spinal axis tumor, brain stem glioma, pituitary adenoma, Kaposi's sarcoma, epidermoid cancer, squamous cell cancer, T -cell lymphoma, environmentally induced cancers including those induced by asbestos, and combinations of said cancers. The compounds of the present disclosure are also useful for the treatment of metastatic cancers, especially metastatic cancers that express PD-Ll.

In some embodiments, cancers treatable with compounds of the present disclosure include melanoma (e.g., metastatic malignant melanoma), renal cancer (e.g. clear cell carcinoma), prostate cancer (e.g. hormone refractory prostate adenocarcinoma), breast cancer, triple-negative breast cancer, colon cancer, lung cancer (e.g. non-small cell lung cancer and small cell lung cancer), squamous cell head and neck cancer, urothelial cancer (e.g. bladder) and cancers with high microsatellite instability (MSI^{high}). Additionally, the disclosure includes refractory or recurrent malignancies whose growth may be inhibited using the compounds of the disclosure.

In some embodiments, cancers that are treatable using the compounds of the present disclosure include, but are not limited to, solid tumors (*e.g.*, prostate cancer, colon cancer, esophageal cancer, endometrial cancer, ovarian cancer, uterine cancer, renal cancer, hepatic cancer, pancreatic cancer, gastric cancer, breast cancer, lung cancer, cancers of the head and neck, thyroid cancer, glioblastoma, sarcoma, bladder cancer, etc.), hematological cancers (*e.g.*, lymphoma, leukemia such as acute lymphoblastic leukemia (ALL), acute myelogenous leukemia (AML), chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), DLBCL, mantle cell lymphoma, Non-Hodgkin lymphoma (including relapsed or refractory NHL and recurrent follicular), Hodgkin lymphoma or multiple myeloma) and

combinations of said cancers.

In some embodiments, cancers that are treatable using the compounds of the present disclosure include, but are not limited to, cholangiocarcinoma, bile duct cancer, triple negative breast cancer, rhabdomyosarcoma, small cell lung cancer, leiomyosarcoma, hepatocellular carcinoma, Ewing's sarcoma, brain cancer, brain tumor, astrocytoma, neuroblastoma, neurofibroma, basal cell carcinoma, chondrosarcoma, epithelioid sarcoma, eye cancer, Fallopian tube cancer, gastrointestinal cancer, gastrointestinal stromal tumors, hairy cell leukemia, intestinal cancer, islet cell cancer, oral cancer, mouth cancer, throat cancer, laryngeal cancer, lip cancer, mesothelioma, neck cancer, nasal cavity cancer, ocular cancer, ocular melanoma, pelvic cancer, rectal cancer, renal cell carcinoma, salivary gland cancer, sinus cancer, spinal cancer, tongue cancer, tubular carcinoma, urethral cancer, and ureteral cancer.

In some embodiments, diseases and indications that are treatable using the compounds of the present disclosure include, but are not limited to hematological cancers, sarcomas, lung cancers, gastrointestinal cancers, genitourinary tract cancers, liver cancers, bone cancers, nervous system cancers, gynecological cancers, and skin cancers.

Exemplary hematological cancers include lymphomas and leukemias such as acute lymphoblastic leukemia (ALL), acute myelogenous leukemia (AML), acute promyelocytic leukemia (APL), chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), diffuse large B-cell lymphoma (DLBCL), mantle cell lymphoma, Non-Hodgkin lymphoma (including relapsed or refractory NHL and recurrent follicular), Hodgkin lymphoma, myeloproliferative diseases (e.g., primary myelofibrosis (PMF), polycythemia vera (PV), essential thrombocytosis (ET)), myelodysplasia syndrome (MDS), T-cell acute lymphoblastic lymphoma (T-ALL) and multiple myeloma.

Exemplary sarcomas include chondrosarcoma, Ewing's sarcoma, osteosarcoma, rhabdomyosarcoma, angiosarcoma, fibrosarcoma, liposarcoma, myxoma, rhabdomyoma, rhabdosarcoma, fibroma, lipoma, harmatoma, and teratoma.

Exemplary lung cancers include non-small cell lung cancer (NSCLC), small cell lung cancer, bronchogenic carcinoma (squamous cell, undifferentiated small cell, undifferentiated large cell, adenocarcinoma), alveolar (bronchiolar) carcinoma, bronchial adenoma, chondromatous hamartoma, and mesothelioma.

Exemplary gastrointestinal cancers include cancers of the esophagus (squamous cell carcinoma, adenocarcinoma, leiomyosarcoma, lymphoma), stomach (carcinoma, lymphoma, leiomyosarcoma), pancreas (ductal adenocarcinoma, insulinoma, glucagonoma, gastrinoma, carcinoid tumors, vipoma), small bowel (adenocarcinoma, lymphoma, carcinoid tumors,

Kaposi's sarcoma, leiomyoma, hemangioma, lipoma, neurofibroma, fibroma), large bowel (adenocarcinoma, tubular adenoma, villous adenoma, hamartoma, leiomyoma), and colorectal cancer.

Exemplary genitourinary tract cancers include cancers of the kidney (adenocarcinoma, Wilm's tumor [nephroblastoma]), bladder and urethra (squamous cell carcinoma, transitional cell carcinoma, adenocarcinoma), prostate (adenocarcinoma, sarcoma), and testis (seminoma, teratoma, embryonal carcinoma, teratocarcinoma, choriocarcinoma, sarcoma, interstitial cell carcinoma, fibroma, fibroadenoma, adenomatoid tumors, lipoma).

Exemplary liver cancers include hepatoma (hepatocellular carcinoma), cholangiocarcinoma, hepatoblastoma, angiosarcoma, hepatocellular adenoma, and hemangioma.

Exemplary bone cancers include, for example, osteogenic sarcoma (osteosarcoma), fibrosarcoma, malignant fibrous histiocytoma, chondrosarcoma, Ewing's sarcoma, malignant lymphoma (reticulum cell sarcoma), multiple myeloma, malignant giant cell tumor chordoma, osteochronfroma (osteocartilaginous exostoses), benign chondroma, chondroblastoma, chondromyxofibroma, osteoid osteoma, and giant cell tumors

Exemplary nervous system cancers include cancers of the skull (osteoma, hemangioma, granuloma, xanthoma, osteitis deformans), meninges (meningioma, meningiosarcoma, gliomatosis), brain (astrocytoma, meduoblastoma, glioma, ependymoma, germinoma (pinealoma), glioblastoma, glioblastoma multiform, oligodendroglioma, schwannoma, retinoblastoma, congenital tumors), and spinal cord (neurofibroma, meningioma, glioma, sarcoma), as well as neuroblastoma and Lhermitte-Duclos disease.

Exemplary gynecological cancers include cancers of the uterus (endometrial carcinoma), cervix (cervical carcinoma, pre -tumor cervical dysplasia), ovaries (ovarian carcinoma (serous cystadenocarcinoma, mucinous cystadenocarcinoma, unclassified carcinoma), granulosa-thecal cell tumors, Sertoli-Leydig cell tumors, dysgerminoma, malignant teratoma), vulva (squamous cell carcinoma, intraepithelial carcinoma, adenocarcinoma, fibrosarcoma, melanoma), vagina (clear cell carcinoma, squamous cell carcinoma, botryoid sarcoma (embryonal rhabdomyosarcoma), and fallopian tubes (carcinoma).

Exemplary skin cancers include melanoma, basal cell carcinoma, squamous cell carcinoma, Kaposi's sarcoma, moles dysplastic nevi, lipoma, angioma, dermatofibroma, and keloids.In some embodiments, diseases and indications that are treatable using the

compounds of the present disclosure include, but are not limited to, sickle cell disease (e.g., sickle cell anemia), triple-negative breast cancer (TNBC), myelodysplastic syndromes, testicular cancer, bile duct cancer, esophageal cancer, and urothelial carcinoma.

PD-1 pathway blockade with compounds of the present disclosure can also be used for treating infections such as viral, bacteria, fungus and parasite infections. The present disclosure provides a method for treating infections such as viral infections. The method includes administering to a patient in need thereof, a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, a salt thereof. Examples of viruses causing infections treatable by methods of the present disclosure include, but are not limit to, human immunodeficiency virus, human papillomavirus, influenza, hepatitis A, B, C or D viruses, adenovirus, poxvirus, herpes simplex viruses, human cytomegalovirus, severe acute respiratory syndrome virus, ebola virus, and measles virus. In some embodiments, viruses causing infections treatable by methods of the present disclosure include, but are not limit to, hepatitis (A, B, or C), herpes virus (e.g., VZV, HSV-1, HAV-6, HSV-II, and CMV, Epstein Barr virus), adenovirus, influenza virus, flaviviruses, echovirus, rhinovirus, coxsackie virus, cornovirus, respiratory syncytial virus, mumpsvirus, rotavirus, measles virus, rubella virus, parvovirus, vaccinia virus, HTLV virus, dengue virus, papillomavirus, molluscum virus, poliovirus, rabies virus, JC virus and arboviral encephalitis virus.

The present disclosure provides a method for treating bacterial infections. The method includes administering to a patient in need thereof, a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a salt thereof. Non-limiting examples of pathogenic bacteria causing infections treatable by methods of the disclosure include chlamydia, rickettsial bacteria, mycobacteria, staphylococci, streptococci, pneumonococci, meningococci and conococci, klebsiella, proteus, serratia, pseudomonas, legionella, diphtheria, salmonella, bacilli, cholera, tetanus, botulism, anthrax, plague, leptospirosis, and Lyme's disease bacteria.

The present disclosure provides a method for treating fungus infections. The method includes administering to a patient in need thereof, a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a salt thereof. Non-limiting examples of pathogenic fungi causing infections treatable by methods of the disclosure include Candida (albicans, krusei, glabrata, tropicalis, etc.), Cryptococcus neoformans, Aspergillus

(fumigatus, niger, etc.), Genus Mucorales (mucor, absidia, rhizophus), Sporothrix schenkii, Blastomyces dermatitidis, Paracoccidioides brasiliensis, Coccidioides immitis and Histoplasma capsulatum.

The present disclosure provides a method for treating parasite infections. The method includes administering to a patient in need thereof, a therapeutically effective amount of a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a salt thereof. Non-limiting examples of pathogenic parasites causing infections treatable by methods of the disclosure include Entamoeba histolytica, Balantidium coli, Naegleriafowleri, Acanthamoeba sp., Giardia lambia, Cryptosporidium sp., Pneumocystis carinii, Plasmodium vivax, Babesia microti, Trypanosoma brucei, Trypanosoma cruzi, Leishmania donovani, Toxoplasma gondi, and Nippostrongylus brasiliensis.

It is believed that compounds of Formula (I), or any of the embodiments thereof, may possess satisfactory pharmacological profile and promising biopharmaceutical properties, such as toxicological profile, metabolism and pharmacokinetic properties, solubility, and permeability. It will be understood that determination of appropriate biopharmaceutical properties is within the knowledge of a person skilled in the art, *e.g.*, determination of cytotoxicity in cells or inhibition of certain targets or channels to determine potential toxicity.

The terms "individual" or "patient," used interchangeably, refer to any animal, including mammals, preferably mice, rats, other rodents, rabbits, dogs, cats, swine, cattle, sheep, horses, or primates, and most preferably humans.

The phrase "therapeutically effective amount" refers to the amount of active compound or pharmaceutical agent that elicits the biological or medicinal response in a tissue, system, animal, individual or human that is being sought by a researcher, veterinarian, medical doctor or other clinician.

As used herein, the term "treating" or "treatment" refers to one or more of (1) inhibiting the disease; *e.g.*, inhibiting a disease, condition or disorder in an individual who is experiencing or displaying the pathology or symptomatology of the disease, condition or disorder (*i.e.*, arresting further development of the pathology and/or symptomatology); and (2) ameliorating the disease; *e.g.*, ameliorating a disease, condition or disorder in an individual who is experiencing or displaying the pathology or symptomatology of the disease, condition or disorder (*i.e.*, reversing the pathology and/or symptomatology) such as decreasing the severity of disease.

In some embodiments, the compounds of the invention are useful in preventing or reducing the risk of developing any of the diseases referred to herein; *e.g.*, preventing or reducing the risk of developing a disease, condition or disorder in an individual who may be predisposed to the disease, condition or disorder but does not yet experience or display the pathology or symptomatology of the disease.

Combination Therapies

Cancer cell growth and survival can be impacted by multiple signaling pathways. Thus, it is useful to combine different enzyme/protein/receptor inhibitors, exhibiting different preferences in the targets which they modulate the activities of, to treat such conditions. Targeting more than one signaling pathway (or more than one biological molecule involved in a given signaling pathway) may reduce the likelihood of drug-resistance arising in a cell population, and/or reduce the toxicity of treatment.

The compounds of the present disclosure can be used in combination with one or more other enzyme/protein/receptor inhibitors or one or more therapies for the treatment of diseases, such as cancer or infections. Examples of diseases and indications treatable with combination therapies include those as described herein. Examples of cancers include solid tumors and liquid tumors, such as blood cancers. Examples of infections include viral infections, bacterial infections, fungus infections or parasite infections. For example, the compounds of the present disclosure can be combined with one or more inhibitors of the following kinases for the treatment of cancer: Akt1, Akt2, Akt3, TGF-βR, PKA, PKG, PKC, CaM-kinase, phosphorylase kinase, MEKK, ERK, MAPK, mTOR, EGFR, HER2, HER3, HER4, INS-R, IGF-1R, IR-R, PDGFαR, PDGFβR, PI3K (alpha, beta, gamma, delta), CSFIR, KIT, FLK-II, KDR/FLK-1, FLK-4, flt-1, FGFR1, FGFR2, FGFR3, FGFR4, c-Met, Ron, Sea, TRKA, TRKB, TRKC, TAM kinases (Axl, Mer, Tyro3), FLT3, VEGFR/Flt2, Flt4, EphA1, EphA2, EphA3, EphB2, EphB4, Tie2, Src, Fyn, Lck, Fgr, Btk, Fak, SYK, FRK, JAK, ABL, ALK and B-Raf. In some embodiments, the compounds of the present disclosure can be combined with one or more of the following inhibitors for the treatment of cancer or infections. Non-limiting examples of inhibitors that can be combined with the compounds of the present disclosure for treatment of cancer and infections include an FGFR inhibitor (FGFR1, FGFR2, FGFR3 or FGFR4, e.g., INCB54828, INCB62079 and INCB63904), a JAK inhibitor (JAK1 and/or JAK2, e.g., ruxolitinib, baricitinib or INCB39110), an IDO inhibitor (e.g., epacadostat, NLG919, or BMS-986205), an LSD1

inhibitor (e.g., INCB59872 and INCB60003), a TDO inhibitor, a PI3K-delta inhibitor (e.g., INCB50797 and INCB50465), a PI3K-gamma inhibitor such as a PI3K-gamma selective inhibitor, a Pim inhibitor, a CSF1R inhibitor, a TAM receptor tyrosine kinases (Tyro-3, Axl, and Mer), a histone deacetylase inhibitor (HDAC) such as an HDAC8 inhibitor, an angiogenesis inhibitor, an interleukin receptor inhibitor, bromo and extra terminal family members inhibitors (for example, bromodomain inhibitors or BET inhibitors such as INCB54329 and INCB57643), a poly ADP ribose polymerase (PARP) inhibitor such as rucaparib, olaparib, niraparib, veliparib, or talazoparib, and an adenosine receptor antagonist or combinations thereof.

Compounds of the present disclosure can be used in combination with one or more immune checkpoint inhibitors. Exemplary immune checkpoint inhibitors include inhibitors against immune checkpoint molecules such as CD27, CD28, CD40, CD122, CD96, CD73, CD47, OX40, GITR, CSF1R, JAK, PI3K delta, PI3K gamma, TAM, arginase, CD137 (also known as 4-1BB), ICOS, A2AR, B7-H3, B7-H4, BTLA, CTLA-4, LAG3, TIM3, VISTA, PD-1, PD-L1 and PD-L2. In some embodiments, the immune checkpoint molecule is a stimulatory checkpoint molecule selected from CD27, CD28, CD40, ICOS, OX40, GITR and CD137. In some embodiments, the immune checkpoint molecule is an inhibitory checkpoint molecule selected from A2AR, B7-H3, B7-H4, BTLA, CTLA-4, IDO, KIR, LAG3, PD-1, TIM3, and VISTA. In some embodiments, the compounds provided herein can be used in combination with one or more agents selected from KIR inhibitors, TIGIT inhibitors, LAIR1 inhibitors, CD160 inhibitors, 2B4 inhibitors and TGFR beta inhibitors.

In some embodiments, the inhibitor of an immune checkpoint molecule is anti-PD1 antibody, anti-PD-L1 antibody, or anti-CTLA-4 antibody.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of PD-1, e.g., an anti-PD-1 monoclonal antibody. In some embodiments, the anti-PD-1 monoclonal antibody is nivolumab, pembrolizumab (also known as MK-3475), pidilizumab, SHR-1210, PDR001, or AMP-224. In some embodiments, the anti-PD-1 monoclonal antibody is nivolumab or pembrolizumab. In some embodiments, the anti-PD1 antibody is pembrolizumab. In some embodiments, the anti PD-1 antibody is SHR-1210.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of PD-L1, e.g., an anti-PD-L1 monoclonal antibody. In some embodiments, the anti-PD-L1 monoclonal antibody is BMS-935559, MEDI4736, MPDL3280A (also known as RG7446), or MSB0010718C. In some embodiments, the anti-PD-L1 monoclonal antibody is MPDL3280A or MEDI4736.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of CTLA-4, e.g., an anti-CTLA-4 antibody. In some embodiments, the anti-CTLA-4 antibody is ipilimumab or tremelimumab.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of LAG3, e.g., an anti-LAG3 antibody. In some embodiments, the anti-LAG3 antibody is BMS-986016, LAG525 or INCAGN2385.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of TIM3, e.g., an anti-TIM3 antibody. In some embodiments, the anti-TIM3 antibody is INCAGN2390, MBG453, or TSR-022.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of GITR, e.g., an anti-GITR antibody. In some embodiments, the anti-GITR antibody is TRX518, MK-4166, INCAGN1876, MK-1248, AMG228, BMS-986156, GWN323, or MEDI1873.

In some embodiments, the inhibitor of an immune checkpoint molecule is an inhibitor of OX40, e.g., an anti-OX40 antibody or OX40L fusion protein. In some embodiments, the anti-OX40 antibody is MEDI0562, MOXR-0916, PF-04518600, GSK3174998, or BMS-986178. In some embodiments, the OX40L fusion protein is MEDI6383.

Compounds of the present disclosure can be used in combination with one or more agents for the treatment of diseases such as cancer. In some embodiments, the agent is an alkylating agent, a proteasome inhibitor, a corticosteroid, or an immunomodulatory agent. Examples of an alkylating agent include cyclophosphamide (CY), melphalan (MEL), and bendamustine. In some embodiments, the proteasome inhibitor is carfilzomib. In some embodiments, the corticosteroid is dexamethasone (DEX). In some embodiments, the immunomodulatory agent is lenalidomide (LEN) or pomalidomide (POM).

The compounds of the present disclosure can further be used in combination with other methods of treating cancers, for example by chemotherapy, irradiation therapy, tumor-targeted therapy, adjuvant therapy, immunotherapy or surgery. Examples of immunotherapy include cytokine treatment (e.g., interferons, GM-CSF, G-CSF, IL-2), CRS-207 immunotherapy, cancer vaccine, monoclonal antibody, adoptive T cell transfer, Toll receptor agonists, STING agonists, oncolytic virotherapy and immunomodulating small molecules, including thalidomide or JAK1/2 inhibitor and the like. The compounds can be administered in combination with one or more anti-cancer drugs, such as a chemotherapeutics. Example chemotherapeutics include any of: abarelix, aldesleukin, alemtuzumab, alitretinoin, allopurinol, altretamine, anastrozole, arsenic trioxide, asparaginase, azacitidine,

bevacizumab, bexarotene, baricitinib, bleomycin, bortezombi, bortezomib, busulfan intravenous, busulfan oral, calusterone, capecitabine, carboplatin, carmustine, cetuximab, chlorambucil, cisplatin, cladribine, clofarabine, cyclophosphamide, cytarabine, dacarbazine, dactinomycin, dalteparin sodium, dasatinib, daunorubicin, decitabine, denileukin, denileukin diftitox, dexrazoxane, docetaxel, doxorubicin, dromostanolone propionate, eculizumab, epirubicin, erlotinib, estramustine, etoposide phosphate, etoposide, exemestane, fentanyl citrate, filgrastim, floxuridine, fludarabine, fluorouracil, fulvestrant, gefitinib, gemcitabine, gemtuzumab ozogamicin, goserelin acetate, histrelin acetate, ibritumomab tiuxetan, idarubicin, ifosfamide, imatinib mesylate, interferon alfa 2a, irinotecan, lapatinib ditosylate, lenalidomide, letrozole, leucovorin, leuprolide acetate, levamisole, lomustine, meclorethamine, megestrol acetate, melphalan, mercaptopurine, methotrexate, methoxsalen, mitomycin C, mitotane, mitoxantrone, nandrolone phenpropionate, nelarabine, nofetumomab, olaparib, oxaliplatin, paclitaxel, pamidronate, panitumumab, pegaspargase, pegfilgrastim, pemetrexed disodium, pentostatin, pipobroman, plicamycin, procarbazine, quinacrine, rasburicase, rituximab, ruxolitinib, rucaparib, sorafenib, streptozocin, sunitinib, sunitinib maleate, tamoxifen, temozolomide, teniposide, testolactone, thalidomide, thioguanine, thiotepa, topotecan, toremifene, tositumomab, trastuzumab, tretinoin, uracil mustard, valrubicin, vinblastine, vincristine, vinorelbine, vorinostat, niraparib, veliparib, talazoparib and zoledronate.

Other anti-cancer agent(s) include antibody therapeutics such as trastuzumab (Herceptin), antibodies to costimulatory molecules such as CTLA-4 (e.g., ipilimumab), 4-1BB (e.g. urelumab, utomilumab), antibodies to PD-1 and PD-L1, or antibodies to cytokines (IL-10, TGF-β, etc.). Examples of antibodies to PD-1 and/or PD-L1 that can be combined with compounds of the present disclosure for the treatment of cancer or infections such as viral, bacteria, fungus and parasite infections include, but are not limited to, nivolumab, pembrolizumab, MPDL3280A, MEDI-4736 and SHR-1210.

The compounds of the present disclosure can further be used in combination with one or more anti-inflammatory agents, steroids, immunosuppressants or therapeutic antibodies.

The compounds of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or salts thereof can be combined with another immunogenic agent, such as cancerous cells, purified tumor antigens (including recombinant proteins, peptides, and carbohydrate molecules), cells, and cells transfected with genes encoding immune stimulating cytokines. Non-limiting examples of tumor vaccines that can be used include peptides of melanoma antigens, such as peptides of

gp100, MAGE antigens, Trp-2, MARTI and/or tyrosinase, or tumor cells transfected to express the cytokine GM-CSF.

The compounds of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or salts thereof can be used in combination with a vaccination protocol for the treatment of cancer. In some embodiments, the tumor cells are transduced to express GM-CSF. In some embodiments, tumor vaccines include the proteins from viruses implicated in human cancers such as Human Papilloma Viruses (HPV), Hepatitis Viruses (HBV and HCV) and Kaposi's Herpes Sarcoma Virus (KHSV). In some embodiments, the compounds of the present disclosure can be used in combination with tumor specific antigen such as heat shock proteins isolated from tumor tissue itself. In some embodiments, the compounds of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or salts thereof can be combined with dendritic cells immunization to activate potent anti-tumor responses.

The compounds of the present disclosure can be used in combination with bispecific macrocyclic peptides that target Fe alpha or Fe gamma receptor-expressing effectors cells to tumor cells. The compounds of the present disclosure can also be combined with macrocyclic peptides that activate host immune responsiveness.

The compounds of the present disclosure can be used in combination with bone marrow transplant for the treatment of a variety of tumors of hematopoietic origin.

The compounds of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or salts thereof can be used in combination with vaccines, to stimulate the immune response to pathogens, toxins, and self antigens. Examples of pathogens for which this therapeutic approach may be particularly useful, include pathogens for which there is currently no effective vaccine, or pathogens for which conventional vaccines are less than completely effective. These include, but are not limited to, HIV, Hepatitis (A, B, & C), Influenza, Herpes, Giardia, Malaria, Leishmania, Staphylococcus aureus, Pseudomonas Aeruginosa.

Viruses causing infections treatable by methods of the present disclosure include, but are not limit to human papillomavirus, influenza, hepatitis A, B, C or D viruses, adenovirus, poxvirus, herpes simplex viruses, human cytomegalovirus, severe acute respiratory syndrome virus, ebola virus, measles virus, herpes virus (e.g., VZV, HSV-1, HAV-6, HSV-II, and CMV, Epstein Barr virus), flaviviruses, echovirus, rhinovirus, coxsackie virus, cornovirus, respiratory syncytial virus, mumpsvirus, rotavirus, measles virus, rubella virus, parvovirus,

vaccinia virus, HTLV virus, dengue virus, papillomavirus, molluscum virus, poliovirus, rabies virus, JC virus and arboviral encephalitis virus.

Pathogenic bacteria causing infections treatable by methods of the disclosure include, but are not limited to, chlamydia, rickettsial bacteria, mycobacteria, staphylococci, streptococci, pneumonococci, meningococci and conococci, klebsiella, proteus, serratia, pseudomonas, legionella, diphtheria, salmonella, bacilli, cholera, tetanus, botulism, anthrax, plague, leptospirosis, and Lyme's disease bacteria.

Pathogenic fungi causing infections treatable by methods of the disclosure include, but are not limited to, Candida (albicans, krusei, glabrata, tropicalis, etc.), Cryptococcus neoformans, Aspergillus (fumigatus, niger, etc.), Genus Mucorales (mucor, absidia, rhizophus), Sporothrix schenkii, Blastomyces dermatitidis, Paracoccidioides brasiliensis, Coccidioides immitis and Histoplasma capsulatum.

Pathogenic parasites causing infections treatable by methods of the disclosure include, but are not limited to, Entamoeba histolytica, Balantidium coli, Naegleriafowleri, Acanthamoeba sp., Giardia lambia, Cryptosporidium sp., Pneumocystis carinii, Plasmodium vivax, Babesia microti, Trypanosoma brucei, Trypanosoma cruzi, Leishmania donovani, Toxoplasma gondi, and Nippostrongylus brasiliensis.

When more than one pharmaceutical agent is administered to a patient, they can be administered simultaneously, separately, sequentially, or in combination (*e.g.*, for more than two agents).

IV. Formulation, Dosage Forms and Administration

When employed as pharmaceuticals, the compounds of the present disclosure can be administered in the form of pharmaceutical compositions. Thus the present disclosure provides a composition comprising a compound of Formula (I) or any of the formulas as described herein, a compound as recited in any of the claims and described herein, or a pharmaceutically acceptable salt thereof, or any of the embodiments thereof, and at least one pharmaceutically acceptable carrier or excipient. These compositions can be prepared in a manner well known in the pharmaceutical art, and can be administered by a variety of routes, depending upon whether local or systemic treatment is indicated and upon the area to be treated. Administration may be topical (including transdermal, epidermal, ophthalmic and to mucous membranes including intranasal, vaginal and rectal delivery), pulmonary (*e.g.*, by inhalation or insufflation of powders or aerosols, including by nebulizer; intratracheal or intranasal), oral or parenteral. Parenteral administration includes intravenous, intraarterial,

subcutaneous, intraperitoneal intramuscular or injection or infusion; or intracranial, *e.g.*, intrathecal or intraventricular, administration. Parenteral administration can be in the form of a single bolus dose, or may be, *e.g.*, by a continuous perfusion pump. Pharmaceutical compositions and formulations for topical administration may include transdermal patches, ointments, lotions, creams, gels, drops, suppositories, sprays, liquids and powders. Conventional pharmaceutical carriers, aqueous, powder or oily bases, thickeners and the like may be necessary or desirable.

This invention also includes pharmaceutical compositions which contain, as the active ingredient, the compound of the present disclosure or a pharmaceutically acceptable salt thereof, in combination with one or more pharmaceutically acceptable carriers or excipients. In some embodiments, the composition is suitable for topical administration. In making the compositions of the invention, the active ingredient is typically mixed with an excipient, diluted by an excipient or enclosed within such a carrier in the form of, *e.g.*, a capsule, sachet, paper, or other container. When the excipient serves as a diluent, it can be a solid, semi-solid, or liquid material, which acts as a vehicle, carrier or medium for the active ingredient. Thus, the compositions can be in the form of tablets, pills, powders, lozenges, sachets, cachets, elixirs, suspensions, emulsions, solutions, syrups, aerosols (as a solid or in a liquid medium), ointments containing, *e.g.*, up to 10% by weight of the active compound, soft and hard gelatin capsules, suppositories, sterile injectable solutions and sterile packaged powders.

In preparing a formulation, the active compound can be milled to provide the appropriate particle size prior to combining with the other ingredients. If the active compound is substantially insoluble, it can be milled to a particle size of less than 200 mesh. If the active compound is substantially water soluble, the particle size can be adjusted by milling to provide a substantially uniform distribution in the formulation, *e.g.*, about 40 mesh.

The compounds of the invention may be milled using known milling procedures such as wet milling to obtain a particle size appropriate for tablet formation and for other formulation types. Finely divided (nanoparticulate) preparations of the compounds of the invention can be prepared by processes known in the art see, *e.g.*, WO 2002/000196.

Some examples of suitable excipients include lactose, dextrose, sucrose, sorbitol, mannitol, starches, gum acacia, calcium phosphate, alginates, tragacanth, gelatin, calcium silicate, microcrystalline cellulose, polyvinylpyrrolidone, cellulose, water, syrup and methyl cellulose. The formulations can additionally include: lubricating agents such as talc,

magnesium stearate and mineral oil; wetting agents; emulsifying and suspending agents; preserving agents such as methyl- and propylhydroxy-benzoates; sweetening agents; and flavoring agents. The compositions of the invention can be formulated so as to provide quick, sustained or delayed release of the active ingredient after administration to the patient by employing procedures known in the art.

In some embodiments, the pharmaceutical composition comprises silicified microcrystalline cellulose (SMCC) and at least one compound described herein, or a pharmaceutically acceptable salt thereof. In some embodiments, the silicified microcrystalline cellulose comprises about 98% microcrystalline cellulose and about 2% silicon dioxide w/w.

In some embodiments, the composition is a sustained release composition comprising at least one compound described herein, or a pharmaceutically acceptable salt thereof, and at least one pharmaceutically acceptable carrier or excipient. In some embodiments, the composition comprises at least one compound described herein, or a pharmaceutically acceptable salt thereof, and at least one component selected from microcrystalline cellulose, lactose monohydrate, hydroxypropyl methylcellulose and polyethylene oxide. In some embodiments, the composition comprises at least one compound described herein, or a pharmaceutically acceptable salt thereof, and microcrystalline cellulose, lactose monohydrate and hydroxypropyl methylcellulose. In some embodiments, the composition comprises at least one compound described herein, or a pharmaceutically acceptable salt thereof, and microcrystalline cellulose, lactose monohydrate and polyethylene oxide. In some embodiments, the composition further comprises magnesium stearate or silicon dioxide. In some embodiments, the microcrystalline cellulose is Avicel PH102™. In some embodiments, the lactose monohydrate is Fast-flo 316™. In some embodiments, the hydroxypropyl methylcellulose is hydroxypropyl methylcellulose 2208 K4M (*e.g.*, Methocel K4 M Premier™) and/or hydroxypropyl methylcellulose 2208 K100LV (*e.g.*, Methocel K00LV™). In some embodiments, the polyethylene oxide is polyethylene oxide WSR 1105 (*e.g.*, Polyox WSR 1105™).

In some embodiments, a wet granulation process is used to produce the composition. In some embodiments, a dry granulation process is used to produce the composition.

The compositions can be formulated in a unit dosage form, each dosage containing from about 5 to about 1,000 mg (1 g), more usually about 100 mg to about 500 mg, of the active ingredient. In some embodiments, each dosage contains about 10 mg of the active ingredient. In some embodiments, each dosage contains about 50 mg of the active ingredient.

In some embodiments, each dosage contains about 25 mg of the active ingredient. The term "unit dosage forms" refers to physically discrete units suitable as unitary dosages for human subjects and other mammals, each unit containing a predetermined quantity of active material calculated to produce the desired therapeutic effect, in association with a suitable pharmaceutical excipient.

The components used to formulate the pharmaceutical compositions are of high purity and are substantially free of potentially harmful contaminants (*e.g.*, at least National Food grade, generally at least analytical grade, and more typically at least pharmaceutical grade). Particularly for human consumption, the composition is preferably manufactured or formulated under Good Manufacturing Practice standards as defined in the applicable regulations of the U.S. Food and Drug Administration. For example, suitable formulations may be sterile and/or substantially isotonic and/or in full compliance with all Good Manufacturing Practice regulations of the U.S. Food and Drug Administration.

The active compound may be effective over a wide dosage range and is generally administered in a therapeutically effective amount. It will be understood, however, that the amount of the compound actually administered will usually be determined by a physician, according to the relevant circumstances, including the condition to be treated, the chosen route of administration, the actual compound administered, the age, weight, and response of the individual patient, the severity of the patient's symptoms and the like.

The therapeutic dosage of a compound of the present invention can vary according to, *e.g.*, the particular use for which the treatment is made, the manner of administration of the compound, the health and condition of the patient, and the judgment of the prescribing physician. The proportion or concentration of a compound of the invention in a pharmaceutical composition can vary depending upon a number of factors including dosage, chemical characteristics (*e.g.*, hydrophobicity), and the route of administration. For example, the compounds of the invention can be provided in an aqueous physiological buffer solution containing about 0.1 to about 10% w/v of the compound for parenteral administration. Some typical dose ranges are from about 1 μg/kg to about 1 g/kg of body weight per day. In some embodiments, the dose range is from about 0.01 mg/kg to about 100 mg/kg of body weight per day. The dosage is likely to depend on such variables as the type and extent of progression of the disease or disorder, the overall health status of the particular patient, the relative biological efficacy of the compound selected, formulation of the excipient, and its

route of administration. Effective doses can be extrapolated from dose-response curves derived from in vitro or animal model test systems.

For preparing solid compositions such as tablets, the principal active ingredient is mixed with a pharmaceutical excipient to form a solid preformulation composition containing a homogeneous mixture of a compound of the present invention. When referring to these preformulation compositions as homogeneous, the active ingredient is typically dispersed evenly throughout the composition so that the composition can be readily subdivided into equally effective unit dosage forms such as tablets, pills and capsules. This solid preformulation is then subdivided into unit dosage forms of the type described above containing from, *e.g.*, about 0.1 to about 1000 mg of the active ingredient of the present invention.

The tablets or pills of the present invention can be coated or otherwise compounded to provide a dosage form affording the advantage of prolonged action. For example, the tablet or pill can comprise an inner dosage and an outer dosage component, the latter being in the form of an envelope over the former. The two components can be separated by an enteric layer which serves to resist disintegration in the stomach and permit the inner component to pass intact into the duodenum or to be delayed in release. A variety of materials can be used for such enteric layers or coatings, such materials including a number of polymeric acids and mixtures of polymeric acids with such materials as shellac, cetyl alcohol and cellulose acetate.

The liquid forms in which the compounds and compositions of the present invention can be incorporated for administration orally or by injection include aqueous solutions, suitably flavored syrups, aqueous or oil suspensions, and flavored emulsions with edible oils such as cottonseed oil, sesame oil, coconut oil, or peanut oil, as well as elixirs and similar pharmaceutical vehicles.

Compositions for inhalation or insufflation include solutions and suspensions in pharmaceutically acceptable, aqueous or organic solvents, or mixtures thereof, and powders. The liquid or solid compositions may contain suitable pharmaceutically acceptable excipients as described *supra*. In some embodiments, the compositions are administered by the oral or nasal respiratory route for local or systemic effect. Compositions can be nebulized by use of inert gases. Nebulized solutions may be breathed directly from the nebulizing device or the nebulizing device can be attached to a face mask, tent, or intermittent positive pressure breathing machine. Solution, suspension, or powder compositions can be administered orally or nasally from devices which deliver the formulation in an appropriate manner.

Topical formulations can contain one or more conventional carriers. In some embodiments, ointments can contain water and one or more hydrophobic carriers selected from, *e.g.*, liquid paraffin, polyoxyethylene alkyl ether, propylene glycol, white Vaseline, and the like. Carrier compositions of creams can be based on water in combination with glycerol and one or more other components, *e.g.*, glycerinemonostearate, PEG-glycerinemonostearate and cetylstearyl alcohol. Gels can be formulated using isopropyl alcohol and water, suitably in combination with other components such as, *e.g.*, glycerol, hydroxyethyl cellulose, and the like. In some embodiments, topical formulations contain at least about 0.1, at least about 0.25, at least about 0.5, at least about 1, at least about 2 or at least about 5 wt % of the compound of the invention. The topical formulations can be suitably packaged in tubes of, *e.g.*, 100 g which are optionally associated with instructions for the treatment of the select indication, *e.g.*, psoriasis or other skin condition.

The amount of compound or composition administered to a patient will vary depending upon what is being administered, the purpose of the administration, such as prophylaxis or therapy, the state of the patient, the manner of administration and the like. In therapeutic applications, compositions can be administered to a patient already suffering from a disease in an amount sufficient to cure or at least partially arrest the symptoms of the disease and its complications. Effective doses will depend on the disease condition being treated as well as by the judgment of the attending clinician depending upon factors such as the severity of the disease, the age, weight and general condition of the patient and the like.

The compositions administered to a patient can be in the form of pharmaceutical compositions described above. These compositions can be sterilized by conventional sterilization techniques, or may be sterile filtered. Aqueous solutions can be packaged for use as is, or lyophilized, the lyophilized preparation being combined with a sterile aqueous carrier prior to administration. The pH of the compound preparations typically will be between 3 and 11, more preferably from 5 to 9 and most preferably from 7 to 8. It will be understood that use of certain of the foregoing excipients, carriers or stabilizers will result in the formation of pharmaceutical salts.

The therapeutic dosage of a compound of the present invention can vary according to, *e.g.*, the particular use for which the treatment is made, the manner of administration of the compound, the health and condition of the patient, and the judgment of the prescribing physician. The proportion or concentration of a compound of the invention in a pharmaceutical composition can vary depending upon a number of factors including dosage, chemical characteristics (*e.g.*, hydrophobicity), and the route of administration. For example,

the compounds of the invention can be provided in an aqueous physiological buffer solution containing about 0.1 to about 10% w/v of the compound for parenteral administration. Some typical dose ranges are from about 1 μg/kg to about 1 g/kg of body weight per day. In some embodiments, the dose range is from about 0.01 mg/kg to about 100 mg/kg of body weight per day. The dosage is likely to depend on such variables as the type and extent of progression of the disease or disorder, the overall health status of the particular patient, the relative biological efficacy of the compound selected, formulation of the excipient, and its route of administration. Effective doses can be extrapolated from dose-response curves derived from *in vitro* or animal model test systems.

V. Labeled Compounds and Assay Methods

The compounds of the present disclosure can further be useful in investigations of biological processes in normal and abnormal tissues. Thus, another aspect of the present invention relates to labeled compounds of the invention (radio-labeled, fluorescent-labeled, *etc.*) that would be useful not only in imaging techniques but also in assays, both *in vitro* and *in vivo*, for localizing and quantitating PD-1 or PD-L1 protein in tissue samples, including human, and for identifying PD-L1 ligands by inhibition binding of a labeled compound. Accordingly, the present invention includes PD-1/PD-L1 binding assays that contain such labeled compounds.

The present invention further includes isotopically-substituted compounds of the disclosure. An "isotopically-substituted" compound is a compound of the invention where one or more atoms are replaced or substituted by an atom having an atomic mass or mass number different from the atomic mass or mass number typically found in nature (*i.e.*, naturally occurring). It is to be understood that a "radio-labeled" is a compound that has incorporated at least one one isotope that is radioactive (e.g., radionuclide). Suitable radionuclides that may be incorporated in compounds of the present invention include but are not limited to ^{3}H (also written as T for tritium), ^{11}C, ^{13}C, ^{14}C, ^{13}N, ^{15}N, ^{15}O, ^{17}O, ^{18}O, ^{18}F, ^{35}S, ^{36}Cl, ^{82}Br, ^{75}Br, ^{76}Br, ^{77}Br, ^{123}I, ^{124}I, ^{125}I and ^{131}I. The radionuclide that is incorporated in the instant radio-labeled compounds will depend on the specific application of that radio-labeled compound. For example, for *in vitro* PD-L1 protein labeling and competition assays, compounds that incorporate ^{3}H, ^{14}C, ^{82}Br, ^{125}I, ^{131}I, ^{35}S or will generally be most useful. For radio-imaging applications ^{11}C, ^{18}F, ^{125}I, ^{123}I, ^{124}I, ^{131}I, ^{75}Br, ^{76}Br or ^{77}Br will generally be most useful.

In some embodiments the radionuclide is selected from the group consisting of ^{3}H, ^{14}C, ^{125}I, ^{35}S and ^{82}Br. Synthetic methods for incorporating radio-isotopes into organic compounds are known in the art.

Specifically, a labeled compound of the invention can be used in a screening assay to identify and/or evaluate compounds. For example, a newly synthesized or identified compound (*i.e.*, test compound) which is labeled can be evaluated for its ability to bind a PD-L1 protein by monitoring its concentration variation when contacting with the PD-L1 protein, through tracking of the labeling. For example, a test compound (labeled) can be evaluated for its ability to reduce binding of another compound which is known to bind to a PD-L1 protein (*i.e.*, standard compound). Accordingly, the ability of a test compound to compete with the standard compound for binding to the PD-L1 protein directly correlates to its binding affinity. Conversely, in some other screening assays, the standard compound is labeled and test compounds are unlabeled. Accordingly, the concentration of the labeled standard compound is monitored in order to evaluate the competition between the standard compound and the test compound, and the relative binding affinity of the test compound is thus ascertained.

VI. Kits

The present disclosure also includes pharmaceutical kits useful, *e.g.*, in the treatment or prevention of diseases or disorders associated with the activity of PD-L1 including its interaction with other proteins such as PD-1 and B7-1 (CD80), such as cancer or infections, which include one or more containers containing a pharmaceutical composition comprising a therapeutically effective amount of a compound of Formula (I), or any of the embodiments thereof. Such kits can further include one or more of various conventional pharmaceutical kit components, such as, *e.g.*, containers with one or more pharmaceutically acceptable carriers, additional containers, *etc.*, as will be readily apparent to those skilled in the art. Instructions, either as inserts or as labels, indicating quantities of the components to be administered, guidelines for administration, and/or guidelines for mixing the components, can also be included in the kit.

The invention will be described in greater detail by way of specific examples. The following examples are offered for illustrative purposes, and are not intended to limit the invention in any manner. Those of skill in the art will readily recognize a variety of non-critical parameters which can be changed or modified to yield essentially the same results.

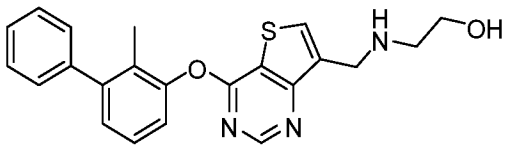
The compounds of the Examples have been found to inhibit the activity of PD-1/PD-L1 protein/protein interaction according to at least one assay described herein.

EXAMPLES

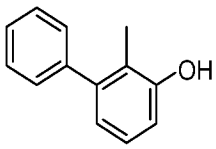
Experimental procedures for compounds of the invention are provided below. Open Access Preparative LCMS Purification of some of the compounds prepared was performed on Waters mass directed fractionation systems. The basic equipment setup, protocols and control software for the operation of these systems have been described in detail in literature. *See*, *e.g.*, Blom, "Two-Pump At Column Dilution Configuration for Preparative LC-MS", K. Blom, *J. Combi. Chem.*, **2002**, *4*, 295-301; Blom *et al.*, "Optimizing Preparative LC-MS Configurations and Methods for Parallel Synthesis Purification", *J. Combi. Chem.*, **2003**, *5*, 670-83; and Blom *et al.*, "Preparative LC-MS Purification: Improved Compound Specific Method Optimization", *J. Combi. Chem.*, **2004**, *6*, 874-883.

Example 1

2-((4-(2-methylbiphenyl-3-yloxy)thieno[3,2-d]pyrimidin-7-yl)methylamino)ethanol

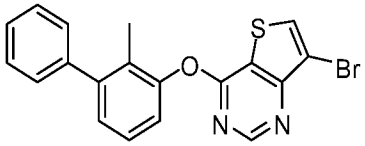


Step 1: 2-methylbiphenyl-3-ol



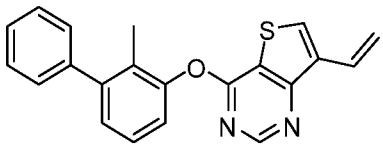
Tetrakis(triphenylphosphine)palladium(0) (300 mg, 0.3 mmol) was added to a mixture of 3-bromo-2-methylphenol (1.0 g, 5.3 mmol), phenylboronic acid (600 mg, 5 mmol), 1,4-dioxane (400 mmol) and water (200 mmol). The mixture was sparged with nitrogen for 1 min, then the mixture was sealed and stirred at 100 °C for 2 h. After cooling and concentrating the mixture in vacuo, the residue was dissolved in DCM and washed with brine. The organic layer was dried over $MgSO_4$, filtered, and concentrated to afford the desired product which was purified by column chromatography (0 → 30% EtOAc/hexanes). LCMS calculated for $C_{13}H_{13}O$ $(M+H)^+$: m/z = 185.1; found 185.1.

Step 2: 7-bromo-4-(2-methylbiphenyl-3-yloxy)thieno[3,2-d]pyrimidine



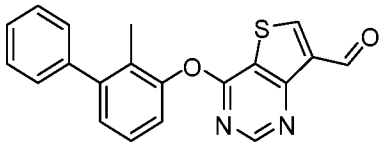
To a mixture of 7-bromo-4-chlorothieno[3,2-d]pyrimidine (Astatech, cat#SC2091: 253 mg, 1.02 mmol), potassium carbonate (280 mg, 2.03 mmol), and N,N-dimethylformamide (60 mmol) was added 2-methylbiphenyl-3-ol (224 mg, 1.22 mmol). The resulting mixture was heated to 100 °C for 1 h. After cooling, the mixture was diluted with water and ethyl acetate. The layers were separated and the organic layer was washed with water (2 X 5 mL) then brine. The organic layer was dried over sodium sulfate, filtered, and concentrated in vacuo. The crude product was used directly in the next step without further purification. LC-MS calculated for $C_{19}H_{14}BrN_2OS$ $(M+H)^+$: m/z = 397.0; found 397.0.

Step 3: 4-[(2-methylbiphenyl-3-yl)oxy]-7-vinylthieno[3,2-d]pyrimidine



A mixture of 7-bromo-N-(2-methylbiphenyl-3-yl)thieno[3,2-d]pyrimidin-4-amine (202 mg, 0.509 mmol), sodium carbonate (108 mg, 1.02 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (0.173 mL, 1.02 mmol), and bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (3.8 mg, 0.0051 mmol) in tert-butyl alcohol (3.66 mL) and water (4 mL) was purged with nitrogen and sealed. The resulting mixture was stirred at 110 °C for 4 h. The reaction mixture was cooled then extracted with ethyl acetate (3x 20 mL). The combined organic layers were concentrated in vacuo. The crude product was used directly in the next step without further purification. LC-MS calculated for $C_{21}H_{17}N_2OS$ $(M+1)^+$: m/z = 345.1; found 345.1.

Step 4: 4-(2-methylbiphenyl-3-yloxy)thieno[3,2-d]pyrimidine-7-carbaldehyde



4-[(2-methylbiphenyl-3-yl)oxy]-7-vinylthieno[3,2-d]pyrimidine (175 mg, 0.509 mmol) was dissolved in 1,4-dioxane (11 mL) and water (11 mL). To this mixture was added 4% osmium tetraoxide in water (0.48 mL, 0.076 mmol). After stirring for 5 min, sodium

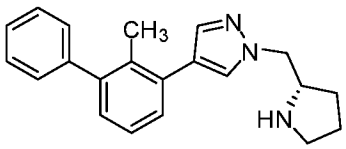
periodate (435 mg, 2.04 mmol) was added and the resulting mixture was stirred for 3 h. The mixture was diluted with ethyl acetate, and the layers were separated. The aqueous layer was further extracted with ethyl acetate. The combined organic layers were washed with brine, dried over $MgSO_4$, filtered, and concentrated in vacuo. The crude aldehyde was purified by silica gel chromatography (0 → 50% EtOAc/hexanes). LC-MS calculated for $C_{20}H_{15}N_2O_2S$ $(M+H)^+$: m/z = 347.1; found 374.2.

Step 5: 2-((4-(2-methylbiphenyl-3-yloxy)thieno[3,2-d]pyrimidin-7-yl)methylamino ethanol

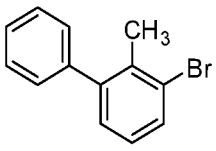
A mixture of 4-[(2-methylbiphenyl-3-yl)oxy]thieno[3,2-d]pyrimidine-7-carbaldehyde (40 mg, 0.12 mmol) and ethanolamine (Aldrich, cat#398136: 0.021 mL, 0.35 mmol) in methylene chloride (1 mL) and N,N-diisopropylethylamine (0.120 mL, 0.69 mmol) was stirred at room temperature for 1 h. Sodium triacetoxyborohydride (0.073 g, 0.35 mmol) was carefully added in portions. The reaction was stirred at room temperature for 24 h. The mixture was diluted in methanol and purified by prep HPLC (pH = 2, acetonitrile/water+TFA) to provide the desired compound as the TFA salt. LC-MS calculated for $C_{22}H_{22}N_3O_2S$ $(M+H)^+$: m/z = 392.1; found 392.1.

Example 2

4-(2-methylbiphenyl-3-yl)-1-[(2S)-pyrrolidin-2-ylmethyl]-1H-pyrazole



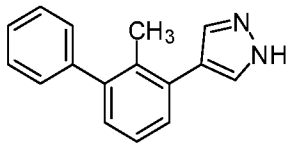
Step 1: 3-bromo-2-methylbiphenyl



To a solution of 1-bromo-3-iodo-2-methylbenzene (800 mg, 2.70 mmol) (Oakwood, cat#037475), phenylboronic acid (344 mg, 2.83 mmol) (Aldrich, cat#78181) and sodium carbonate (712 mg, 6.72 mmol) in tert-butyl alcohol (12 mL) and water (4 mL) was added dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II) (204 mg, 267 μmol). The reaction mixture was purged with N_2, and then heated at 90 °C for 2 h. The reaction mixture was diluted with methylene chloride, washed with saturated $NaHCO_3$, water and brine. The organic layer was dried over Na_2SO_4, filtered and concentrated. The residue was purified by

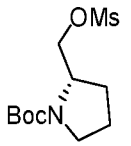
flash chromatography on a silica gel column eluting with 10 to 20% ethyl acetate in hexanes to give the desired product (520 mg, 61%).

Step 2: 4-(2-methylbiphenyl-3-yl)-1H-pyrazole



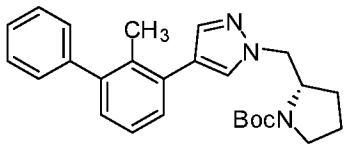
To a solution of 3-bromo-2-methylbiphenyl (500 mg, 2 mmol), 4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1H-pyrazole (Acros, cat#382940050: 471 mg, 2.43 mmol) and sodium carbonate (536 mg, 5.06 mmol) in tert-butyl alcohol (10 mL) and water (4 mL) was added dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II) (153 mg, 0.202 mmol). The mixture was purged with N_2, and then heated at 110°C for 2 h. The reaction mixture was diluted with methylene chloride, washed with saturated $NaHCO_3$, water and brine. The organic layer was dried over Na_2SO_4, filtered and concentrated. The residue was purified by flash chromatography on a silica gel column eluting with 30 to 60% ethyl acetate in hexanes to give the desired product (308 mg, 60%). LC-MS calculated for $C_{16}H_{15}N_2$ $(M+H)^+$: m/z = 235.2; found 235.2.

Step 3: tert-butyl (2S)-2-{[(methylsulfonyl)oxy]methyl}pyrrolidine-1-carboxylate



To a solution of tert-butyl (2S)-2-(hydroxymethyl)pyrrolidine-1-carboxylate (Aldrich, cat#446327: 34.4 mg, 0.171 mmol) and triethylamine (0.512 mmol) in methylene chloride (1 mL) was added methanesulfonyl chloride (19.8 μL, 0.256 mmol) at 0 °C. The resulting mixture was stirred at room temperature for 1 h then diluted with EtOAc and washed with sat'd $NaHCO_3$. The organic layer was dried over Na_2SO_4, filtered and concentrated. The residue was used in the next step without further purification.

Step 4: tert-butyl (2S)-2-{[4-(2-methylbiphenyl-3-yl)-1H-pyrazol-1-yl]methyl}pyrrolidine-1-carboxylate



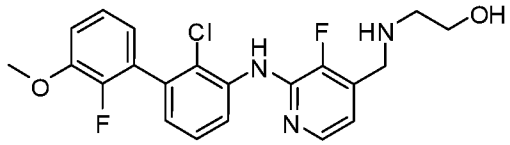
To a solution of 4-(2-methylbiphenyl-3-yl)-1H-pyrazole (20.0 mg, 0.0854 mmol) and the crude product from Step 3 in acetonitrile (0.5 mL) was added cesium carbonate (139 mg, 0.427 mmol). The reaction mixture was heated at 100 °C for 16 h, then diluted with water and extracted with methylene chloride. The combined extracts were washed with water and brine then dried over Na_2SO_4, filtered and concentrated under reduced pressure. The residue was used in the next step without further purification. LC-MS calculated for $C_{26}H_{32}N_3O_2$ $(M+H)^+$: m/z = 418.2; found 418.1.

Step 5: 4-(2-methylbiphenyl-3-yl)-1-[(2S)-pyrrolidin-2-ylmethyl]-1H-pyrazole

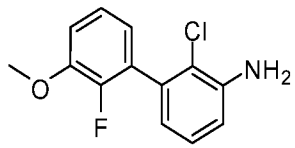
The crude product from *Step 4* was dissolved in methylene chloride (0.6 mL) then treated with TFA (0.3 mL). The resulting mixture was stirred at room temperature for 30 min before concentrated and purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to give the desired product as the TFA salt. LC-MS calculated for $C_{21}H_{24}N_3$ $(M+H)^+$: m/z = 318.2; found 318.2.

Example 3

2-((2-(2-chloro-2'-fluoro-3'-methoxybiphenyl-3-ylamino)-3-fluoropyridin-4-yl)methylamino)ethanol



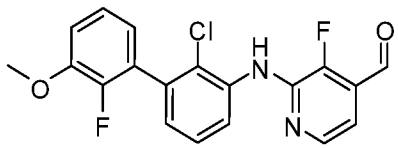
Step 1: 2-chloro-2'-fluoro-3'-methoxybiphenyl-3-amine



A mixture of 3-bromo-2-chloroaniline (Ark Pharm, cat#AK156407: 700 mg, 3.39 mmol), (2-fluoro-3-methoxyphenyl)boronic acid (Combi-Blocks, cat#BB-2460: 576 mg, 3.39 mmol), [1,1'-bis(dicyclohexylphosphino)ferrocene]dichloropalladium(II) (20 mg, 0.027 mmol) (Sigma-Aldrich, cat#701998), Na_2CO_3 (1.17g, 8.48 mmol) in dioxane (18.8 mL) and water (6.1 mL) was sparged with nitrogen. The reaction mixture was heated to 90 °C for

2 h with stirring. After cooling to room temperature, the reaction mixture was diluted with water, and extracted with EtOAc. The combined organic layers were washed with brine, dried over magnesium sulfate, filtered, and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel column eluting with 0 to 15% methanol in dichloromethane to afford the desired product (791 mg, 93%). LCMS calculated for $C_{13}H_{12}ClFNO$ $(M+H)^+$: m/z = 252.1; found 252.1.

Step 2: 2-(2-chloro-2'-fluoro-3'-methoxybiphenyl-3-ylamino)-3-fluoroisonicotinaldehyde



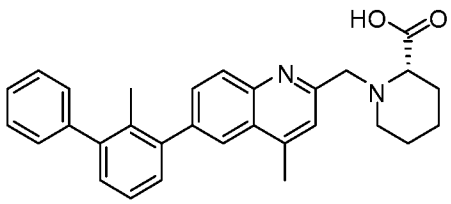
A mixture of 2-chloro-2'-fluoro-3'-methoxybiphenyl-3-amine (150 mg, 0.596 mmol), 2-bromo-3-fluoroisonicotinaldehyde (Combi-Blocks, cat#QC-5746: 122 mg, 0.596 mmol), XantPhos Pd G3 (56.5 mg, 0.060 mmol), cesium carbonate (388 mg, 1.192 mmol), and 1,4-dioxane (12 mL) was sparged with nitrogen. The reaction mixture was heated to 90 °C for 3 h with stirring. After cooling to room temperature, the reaction mixture was diluted with water, and extracted with ethyl acetate. The combined organic layers were washed with brine, dried over magnesium sulfate, filtered through a pad of silica gel. The crude product was used directly in the next step without further purification. LCMS calculated for $C_{19}H_{14}ClF_2N_2O_2$ $(M+H)^+$: m/z = 375.1; found 375.2.

Step 3: 2-((2-(2-chloro-2'-fluoro-3'-methoxybiphenyl-3-ylamino)-3-fluoropyridin-4-yl)methylamino)ethanol

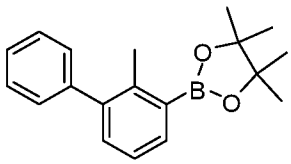
A mixture of 2-(2-chloro-2'-fluoro-3'-methoxybiphenyl-3-ylamino)-3-fluoroisonicotinaldehyde (20 mg, 0.053 mmol), ethanolamine (12 μL, 0.16 mmol), N,N-diisopropylethylamine (0.046 mL, 0.267 mmol), 1,2-dichloroethane (0.5 mL) and methanol (0.15 mL) was heated to 50 °C for 3 hours. Sodium borohydride (6 mg, 0.16 mmol) was added to the mixture. The reaction mixture was allowed to stir until gas evolution ceased. The reaction was cooled to room temperature, diluted with methanol, passed through a syringe filter and purified on prep-HPLC (pH=2, acetonitrile/water+TFA) to give the desired product as the TFA salt. LCMS calculated for $C_{21}H_{21}ClF_2N_3O_2$ $(M+H)^+$: m/z = 420.1; found 420.3.

Example 4

(S)-1-((4-methyl-6-(2-methylbiphenyl-3-yl)quinolin-2-yl)methyl)piperidine-2-carboxylic acid

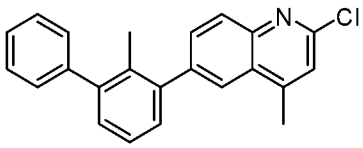


Step 1: 4,4,5,5-tetramethyl-2-(2-methylbiphenyl-3-yl)-1,3,2-dioxaborolane



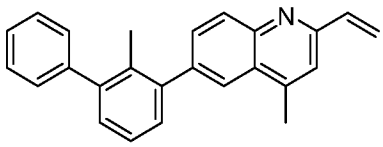
A mixture of 3-bromo-2-methylbiphenyl (Example 2, Step 1: 0.85 g, 3.4 mmol), potassium acetate (0.84 g, 8.6 mmol), 4,4,5,5,4',4',5',5'-Octamethyl-[2,2']bi[[1,3,2]dioxaborolanyl] (Aldrich, cat#473294: 1.0 g, 4.1 mmol), and [1,1'-is(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (100 mg, 0.2 mmol) in 1,4-dioxane was degassed for 5 min. The vessel was sealed and the reaction mixture was stirred at 100°C for 2 hours. After cooling to rt, the reaction mixture was concentrated and purified by flash chromatography.

Step 2: 2-chloro-4-methyl-6-(2-methylbiphenyl-3-yl)quinoline



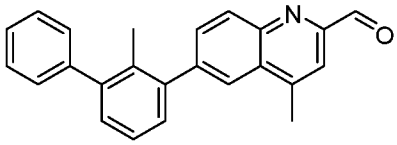
A mixture of 6-bromo-2-chloro-4-methylquinoline (Combi-Blocks, cat#HC-6774: 0.20 g, 0.78 mmol), 4,4,5,5-tetramethyl-2-(2-methylbiphenyl-3-yl)-1,3,2-dioxaborolane (0.25 g, 0.86 mmol), tetrakis(triphenylphosphine)palladium(0) (90. mg, 0.078 mmol) and cesium carbonate (0.51 g, 1.6 mmol) in 1,4-dioxane and water in a reaction vial was degassed and sealed. It was stirred at 80 °C for 2 hours. After cooling to rt, the reaction mixture was concentrated and purified by flash column chromatography (eluted with 0 to 30% ethyl acetate/hexane) to give a mixture (190 mg) of the desired product with the by-product 6-bromo-4-methyl-2-(2-methylbiphenyl-3-yl)quinolone, which was used in the next step without further purification.

Step 3: 4-methyl-6-(2-methylbiphenyl-3-yl)-2-vinylquinoline



A mixture of 2-chloro-4-methyl-6-(2-methylbiphenyl-3-yl)quinoline and 6-bromo-4-methyl-2-(2-methylbiphenyl-3-yl)quinolone (190 mg, 0.49 mmol) from Step 1, cesium carbonate (320 mg, 0.98 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (Aldrich, cat#633348: 0.73 mmol), and tetrakis(triphenylphosphine)palladium(0) (56 mg, 0.049 mmol) in 1,4-dioxane and water in a reaction vial was degassed and sealed. The reaction mixture was stirred at 80 °C for 20 hours. After cooling to rt, the reaction mixture was concentrated and purified by flash chromatography (eluted with 0 to 30 % ethyl acetate/hexane) to give a mixture of the desired product with the isomer 4-methyl-2-(2-methylbiphenyl-3-yl)-6-vinylquinoline, which was used in the next step without further purification.

Step 4: 4-methyl-6-(2-methylbiphenyl-3-yl)quinoline-2-carbaldehyde



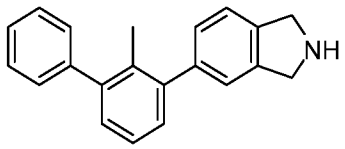
To a mixture of 4-methyl-2-(2-methylbiphenyl-3-yl)-6-vinylquinoline and 4-methyl-6-(2-methylbiphenyl-3-yl)-2-vinylquinoline (130 mg, 0.39 mmol) dissolved in 1,4-dioxane (3 ml) and water (1 ml) was added a 15 % w/w osmium tetraoxide in water solution (0.38 ml, 0.060 mmol) at room temperature. The mixture was stirred for 5 min then sodium periodate (0.33 g, 1.5 mmol) was added. The reaction mixture was stirred at rt overnight. The reaction mixture was diluted with water and extracted with EtOAc twice. The combined extracts were washed with water and brine, dried over Na_2SO_4, and filtered. The filtrate was concentrated under reduced pressure. The residue was purified by flash chromatography. Two compounds were separated and obtained. The minor product was the desired compound and the structure was confirmed in the final step. LCMS calculated for $C_{24}H_{20}NO$ $(M+H)^+$: m/z = 338.2; found 338.0.

Step 5: (S)-1-((4-methyl-6-(2-methylbiphenyl-3-yl)quinolin-2-yl)methyl)piperidine-2-carboxylic acid

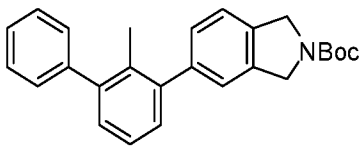
A mixture of 4-methyl-6-(2-methylbiphenyl-3-yl)quinoline-2-carbaldehyde (10 mg, 0.03 mmol) and (2S)-piperidine-2-carboxylic acid (10 mg, 0.09 mmol) in methylene chloride (1 ml) and acetic acid (0.1 mmol) was stirred at rt for 2 hours. To the mixture was then added sodium triacetoxyborohydride (19 mg, 0.089 mmol). The resulting mixture was stirred at rt overnight. The solvent was removed. The residue was dissolved in methanol, purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to give the desired product as the TFA salt. LCMS calculated for $C_{30}H_{31}N_2O_2$ $(M+H)^+$: m/z = 451.2; found 451.2. ^{1}H NMR (500 MHz, DMSO) δ 8.13 – 8.07 (m, 2H), 7.88 (dd, *J* = 8.6, 1.9 Hz, 1H), 7.53 (s, 1H), 7.50 – 7.33 (m, 7H), 7.28 (dd, *J* = 7.3, 1.6 Hz, 1H), 4.76 – 4.45 (m, 2H), 4.21 – 4.08 (m, 1H), 3.53 – 3.43 (m, 1H), 3.18 – 3.05 (m, 1H), 2.76 (s, 3H), 2.19 – 2.13 (m, 1H), 2.11 (s, 3H), 1.95 – 1.83 (m, 1H), 1.80 – 1.71 (m, 2H), 1.69 – 1.49 (m, 2H).

Example 5

5-(2-methylbiphenyl-3-yl)isoindoline



Step 1: tert-butyl 5-(2-methylbiphenyl-3-yl)isoindoline-2-carboxylate



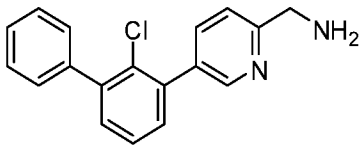
A mixture of 3-bromo-2-methylbiphenyl (Example 2, Step 1: 40 mg, 0.2 mmol), tert-butyl 5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1,3-dihydro-2H-isoindole-2-carboxylate (67 mg, 0.19 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II) dichloromethane complex (1:1) (7 mg, 0.008 mmol) and potassium carbonate (67 mg, 0.48 mmol) in 1,4-dioxane (20 mL) and water (1 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 120 °C overnight. The reaction mixture was quenched with water, and extracted with ethyl acetate (3x 10 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the crude product.

Step 2: 5-(2-methylbiphenyl-3-yl)isoindoline

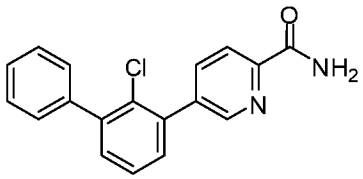
TFA (1 mL) was added to the solution of the crude product from Step 1 in DCM (1 mL). The reaction mixture was stirred at room temperature for 1h. The reaction mixture was concentrated under reduced pressure. The residue was purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to afford the desired product as TFA salt. LCMS calculated for $C_{21}H_{20}N$ $(M+H)^+$: m/z = 286.2; found 286.2.

Example 6

(5-(2-chlorobiphenyl-3-yl)pyridin-2-yl)methanamine



Step 1: 5-(2-chlorobiphenyl-3-yl)picolinamide



A mixture of 1,3-dibromo-2-chlorobenzene (Combi-Blocks, cat#QA2717: 200 mg, 0.74 mmol), phenylboronic acid (95 mg, 0.78 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II) dichloromethane complex (1:1) (30 mg, 0.04 mmol) and potassium carbonate (0.51 g, 3.7 mmol) in 1,4-dioxane (10 mL) and water (5 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 80 °C for 4 h. The reaction mixture was cooled to room temperature and then 5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pyridine-2-carbonitrile (Combi-Blocks, cat#PN-8873: 0.17 g, 0.74 mmol) was added. The mixture was then stirred at 110 °C for 4h. The reaction mixture was cooled to room temperature, quenched with water, and extracted with ethyl acetate (3 x 10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and concentrated under reduced pressure. The residue was purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to afford the desired product as the TFA salt. LCMS calculated for $C_{18}H_{14}ClN_2O$ $(M+H)^+$: m/z = 309.1; found 309.1.

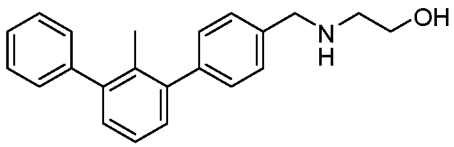
Step 2: (5-(2-chlorobiphenyl-3-yl)pyridin-2-yl)methanamine

1.0 M Lithium tetrahydroaluminate in THF (1.0 mL) was added to a mixture of

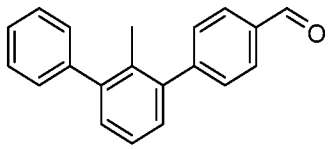
5-(2-chlorobiphenyl-3-yl)pyridine-2-carboxamide (50 mg, 0.2 mmol) in THF (1mL). The reaction mixture was stirred at room temperature overnight. The reaction mixture was quenched with saturated aqueous NH_4Cl, and extracted with ethyl acetate (3 x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to afford the desired product as TFA salt. LCMS calculated for $C_{18}H_{16}ClN_2$ $(M+H)^+$: m/z = 295.1; found 295.1.

Example 7

2-{[(2'-methyl-1,1':3',1''-terphenyl-4-yl)methyl]amino}ethanol



Step 1: 2'-methyl-1,1':3',1''-terphenyl-4-carbaldehyde



A mixture of 3-bromo-2-methylbiphenyl (Example 2, Step 1: 201 mg, 0.813 mmol), 4-formylphenylboronic acid (Aldrich, cat#431966: 130 mg, 0.89 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II) dichloromethane complex (1:1) (30 mg, 0.04 mmol) and potassium carbonate (340 mg, 2.4 mmol) in 1,4-dioxane (10 mL) and water (5 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 110 °C overnight. The reaction mixture was quenched with water, and extracted with ethyl acetate (3x10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and concentrated under reduced pressure to afford the crude product, which was used in the next step without further purification.

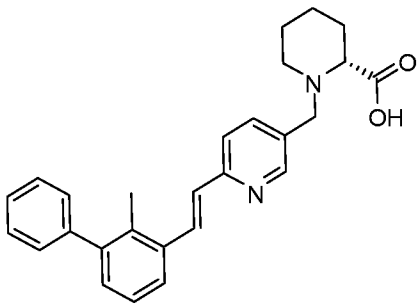
Step 2: 2-{[(2'-methyl-1,1':3',1''-terphenyl-4-yl)methyl]amino}ethanol

Ethanolamine (5.4 uL, 0.082 mmol) was added to a solution of 2'-methyl-1,1':3',1''-terphenyl-4-carbaldehyde (15 mg, 0.055 mmol) in N,N-dimethylformamide (0.5 mL), followed by acetic acid (9.4 uL, 0.16 mmol). After 5 min, sodium cyanoborohydride (10.0 mg, 0.16 mmol) was added. The reaction mixture was stirred at room temperature overnight. The mixture was purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to

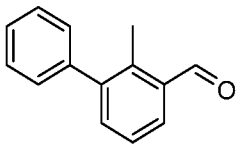
afford the desired product as the TFA salt. LCMS calculated for $C_{22}H_{24}NO$ $(M+H)^+$: m/z = 318.2; found 318.2.

Example 8

(R,E)-1-((6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)pyridin-3-yl)methyl)piperidine-2-carboxylic acid

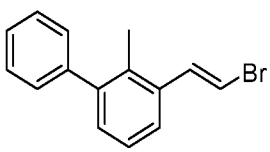


Step 1: 2-methyl-[1,1'-biphenyl]-3-carbaldehyde



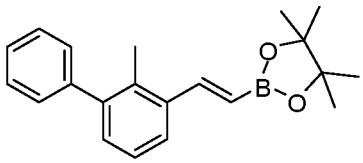
Dess–Martin periodinane (8.32 mmol) was added to a solution of (2-methyl-[1,1'-biphenyl]-3-yl)methanol (TCI, cat#H0777:1.5 g, 7.57 mmol) in methylene chloride (16.00 ml, 250 mmol). After 0.5 h, saturated aqueous $NaHCO_3$ was added. After stirring for 0.5 h, the mixture was filtered. The organic layer was washed with saturated aqueous $NaHCO_3$, 10% w/w aqueous Na_2CO_3, and then brine. The organic layer was dried over Na_2SO_4, filtered and concentrated under reduced pressure to provide the desired aldehyde as a pale orange paste. The crude material was purified by silica gel chromatography (eluting with 0 - 15% ethyl acetate in hexanes) providing a colorless oil which was triturated w/ ~ hexanes to give 0.85 g of the desired product as a white crystalline solid (57.2% yield). LC-MS calculated for $C_{14}H_{13}O$ $(M+H)^+$: m/z = 197.1; found 197.2. ^1H NMR (400 MHz, CDCl3) δ 10.41 (s, 1H), 7.86 (dd, J = 7.5, 1.3 Hz, 2H), 7.68 – 7.36 (m, 3H), 7.39 – 7.22 (m, 3H), 2.58 (s, 3H).

Step 2: (E)-3-(2-bromovinyl)-2-methyl-1,1'-biphenyl



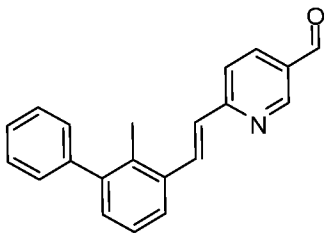
To a suspension of (bromomethyl)triphenylphosphonium bromide (Aldrich, cat#269158: 2.369 g, 5.43 mmol) in THF (15.93 ml, 196 mmol) at -78 °C was added 1.0 M potassium tert-butoxide in THF (5.43 mmol) over 5min, and the reaction mixture was stirred for 1 h. 2-methyl-[1,1'-biphenyl]-3-carbaldehyde (0.82 g, 4.18 mmol) was added and allowed to warm to -40 °C over 4h. The reaction was then allowed to warm up to rt and was stirred for another 1 h. The reaction was quenched with water and then diluted with ethyl acetate. The organic layer was washed with water x2, and saturated NaCl. The organic layer was then dried over Na_2SO_4 and rotovaped to give 1.55 g orange paste. The crude was purified by silica gel chromatography eluting with 0-5% ethyl acetate in hexanes to give 1.55 g colorless oil (74% yield). LC-MS calculated for $C_{15}H_{14}Br$ $(M+H)^+$: m/z = 273.0; found 273.1. ^1H NMR (400 MHz, $CDCl_3$) δ 7.55 (d, J = 7.5 Hz, 1H), 7.48 – 7.08 (m, 8H), 6.61 (d, J = 7.8 Hz, 1H), 2.20 (s, 3H).

Step 3: (E)-4,4,5,5-tetramethyl-2-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)-1,3,2-dioxaborolane



To a reaction vial was combined (E)-3-(2-bromovinyl)-2-methyl-1,1'-biphenyl (0.85 g, 3.11 mmol), potassium acetate (0.584 ml, 9.33 mmol) and 4,4,4',4',5,5,5',5'-octamethyl-2,2'-bi(1,3,2-dioxaborolane) (1.344 ml, 4.67 mmol). To this mixture was added 1,4-dioxane (14.08 ml, 180 mmol) and the resulting mixture was sparged with nitrogen for 5 min. [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium(II) dichloromethane complex (1:1) (0.127 g, 0.156 mmol) was then added, and the reaction was sealed and heated to 90 °C for 4h. The reaction was cooled, and concentrated under reduced pressure to give a black solid/glass. Ethyl acetate and water were added. The layers were separated and the organic phase was washed brine. The organic layer was dried over Na_2SO_4 and concentrated in vacuo to give 1.75 g of a black oil. The mixture was purified by silica gel chromatography (eluting with 0-10% ethyl acetate in hexanes) to give 0.66 g of the desired product as an orange oil (66% yield). LC-MS calculated for $C_{21}H_{26}BO_2$ $(M+H)^+$: m/z = 321.2; found 321.2.

Step 4: (E)-6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)nicotinaldehyde



A degased mixture of 6-bromonicotinaldehyde (Aldrich, cat#596280: 4.91 mg, 0.026 mmol), (Z)-4,4,5,5-tetramethyl-2-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)-1,3,2-dioxaborolane (10.99 mg, 0.034 mmol), dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II) (20. mg, 0.026 mmol) and potassium carbonate (6.39 µl, 0.071 mmol) in 1,4-dioxane (1 mL) and water (0.3 mL) was heated at 90 °C overnight. Ethyl acetate and water were added, and the mixture was filtered. The organic phase was washed brine, dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude mixture was purified by silica gel chromatography eluting with 0-25% ethyl acetate in hexanes to give the desired product as a colorless oil. LC-MS calculated for $C_{21}H_{18}NO$ $(M+H)^+$: m/z = 300.1; found 300.2.

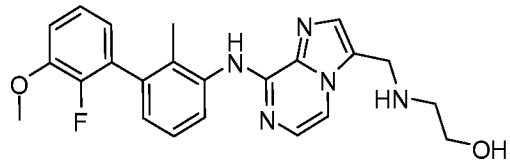
Step 5: (R,E)-1-((6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)pyridin-3-yl)methyl)piperidine-2-carboxylic acid

A mixture of (E)-6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)nicotinaldehyde (53.7 mg, 0.179 mmol), methyl (S)-piperidine-2-carboxylate hydrochloride (Combi-Blocks, cat#YC-0952: 97 mg, 0.538 mmol) and N,N-diisopropylethylamine (0.156 mL, 0.896 mmol) in methylene chloride (1 mL) was stirred for 3h. Sodium triacetoxyborohydride (38 mg, 0.179 mmol) was added and stirred overnight. The organic phase was washed with water, aqueous saturated $NaHCO_3$, then brine. The organic layer was then dried over Na_2SO_4, filtered, and concentrated.

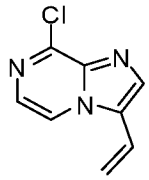
The resulting residue ((R,E)-1-((6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)pyridin-3-yl)methyl)piperidine-2-carboxylate (8.8 mg, 0.021 mmol)) was dissolved in methanol (1 mL), tetrahydrofuran (1 mL) and 1.0 M sodium hydroxide in water (4.48 mmol) and then was stirred for 1.5 h. The mixture was then diluted with methanol and purified by prep-HPLC (pH = 10, acetonitrile/water+NH_4OH) to provide the desired compound as a white powder. LC-MS calculated for $C_{27}H_{29}N_2O_2$ $(M+H)^+$: m/z = 413.2; found 413.2.

Example 9

2-(((8-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)imidazo[1,2-a]pyrazin-3-yl)methyl)amino)ethan-1-ol

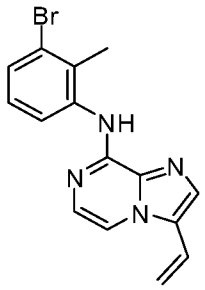


Step 1: 8-chloro-3-vinylimidazo[1,2-a]pyrazine



A mixture of 3-bromo-8-chloroimidazo[1,2-a]pyrazine (Alchem Pharmtech, cat#Z-01430: 1.5 g, 6.4 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (Aldrich, cat#633348: 7.1 mmol), sodium carbonate (1.4 g, 13 mmol) and dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II) (75 mg, 0.099 mmol) in 1,4-dioxane (15 mL) and water (5 mL) was degassed and heated at 97 °C overnight. Ethyl acetate and water were added and the mixture was filtered. The layers were separated and the aqueous phase was further extracted with ethyl acetate. The combined organic layers were washed with brine, dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude residue was purified by silica gel chromatography eluting with 0-50% ethyl acetate in hexanes to give 0.23 g pale orange solid (20% yield). LC-MS calculated for $C_8H_7ClN_3$ $(M+H)^+$: m/z = 180.0; found 180.0.

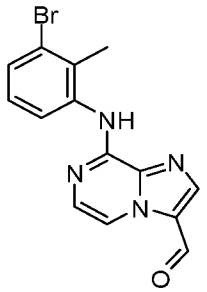
Step 2: (N-(3-bromo-2-methylphenyl)-3-vinylimidazo[1,2-a]pyrazin-8-amine



A suspension of 3-bromo-2-methylaniline (Aldrich, cat#530018: 0.12 mL, 0.974 mmol), cesium carbonate (1.071 mmol) and 8-chloro-3-vinylimidazo[1,2-a]pyrazine (0.175 g, 0.974 mmol) in acetonitrile (1.679 mL, 32.1 mmol) was heated at 105 °C overnight. Ethyl

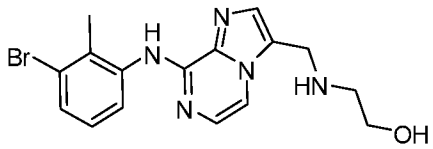
acetate and water were added and the mixture was filtered. The organic layer was washed with brine, dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude residue was purified by silica gel chromatography eluting with 0-25% ethyl acetate in hexanes to give 0.11 g of an off-white solid (39% yield). LC-MS calculated for $C_{15}H_{14}BrN_4$ $(M+H)^+$: m/z = 329.0; found 329.0.

Step 3: 8-[(3-bromo-2-methylphenyl)amino]imidazo[1,2-a]pyrazine-3-carbaldehyde



To a solution N-(3-bromo-2-methylphenyl)-3-vinylimidazo[1,2-a]pyrazin-8-amine (0.11 g, 0.334 mmol) of in 1,4-dioxane (3 mL) and water (3 mL) was added 0.157 M osmium tetraoxide in water (0.053 mmol). After 2 min, the reaction turned orange. Sodium metaperiodate (0.35 g, 1.6 mmol) was added and the reaction was stirred for 3 h. Ethyl acetate and water were added, and the mixture was filtered. The organic phase was washed with aqueous saturated $NaHCO_3$ and dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude residue was purified by silica gel chromatography eluting with 0-50% ethyl acetate in hexanes to give the desired product as an orange solid. LC-MS calculated for $C_{14}H_{12}BrN_4O$ $(M+H)^+$: m/z = 331.0; found 331.1.

Step 4: 2-[({8-[(3-bromo-2-methylphenyl)amino]imidazo[1,2-a]pyrazin-3-yl}methyl)amino]ethanol



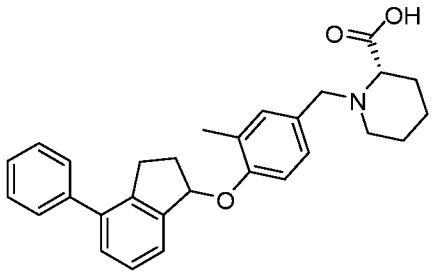
To a suspension of 8-((3-bromo-2-methylphenyl)amino)imidazo[1,2-a]pyrazine-3-carbaldehyde (0.170 g, 0.514 mmol) in methylene chloride (4 mL) was added 2-aminoethan-1-ol (31 µL, 0.514 mmol) then acetic acid (29.2 µL, 0.514 mmol). After 1h, sodium triacetoxyborohydride (0.272 g, 1.284 mmol) was added and stirred overnight. Water was added, and the layers were separated. The organic phase was washed aqueous saturated

sodium bicarbonate, brine, dried over Na_2SO_4, filtered, and concentrated in vacuo. The resulting residue was triturated with 3 mL METB to provide the desired product as an orange solid. LC-MS calculated for $C_{16}H_{10}BrN_5O$ $(M+H)^+$: m/z = 376.1; found 376.1.

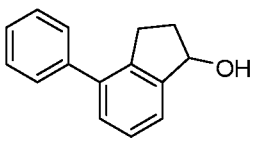
Step 5: 2-(((8-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)imidazo[1,2-a]pyrazin-3-yl)methyl)amino)ethan-1-ol

A mixture of 2-[({8-[(3-bromo-2-methylphenyl)amino]imidazo[1,2-a]pyrazin-3-yl}methyl)amino]ethanol (10. mg, 0.026 mmol), (2-fluoro-3-methoxyphenyl)boronic acid (Aldrich, cat#594253:8.2 mg, 0.048 mmol), sodium carbonate (8.4 mg, 0.080 mmol) and dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II) (3.5 mg, 0.0046 mmol) in 1,4-dioxane (0.3 mL) and water (0.1 mL) was degassed and refluxed at 110 °C overnight. The mixture was diluted with methanol and purified by prep-HPLC (pH = 10, acetonitrile/water+NH_4OH) to provide the desired compound as a white powder. LC-MS calculated for $C_{23}H_{25}FN_5O_2$ $(M+H)^+$: m/z = 422.2; found 422.2.

Example 10: (2S)-1-(3-methyl-4-(4-phenyl-2,3-dihydro-1H-inden-1-yloxy)benzyl)piperidine-2-carboxylic acid



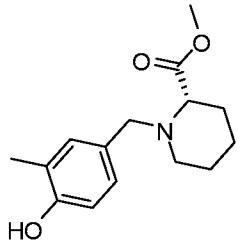
Step 1: 4-phenyl-2,3-dihydro-1H-inden-1-ol



A mixture of 4-bromoindan-1-ol (*Combi-Blocks cat#QH-683:* 321 mg, 1.51 mmol), Phenylboronic acid (*Aldrich cat# P20009:* 220 mg, 1.81 mmol), bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (60 mg, 0.08 mmol) and Potassium phosphate (1300 mg, 6.0 mmol) in a mixture of Water (3mL) and 1,4-Dioxane (20 mL) was degassed with nitrogen, then heated in a sealed vial at 90 °C 3 hours. The reaction mixture was cooled to room temperature and filtered. The filtrate was concentrated to dryness. The

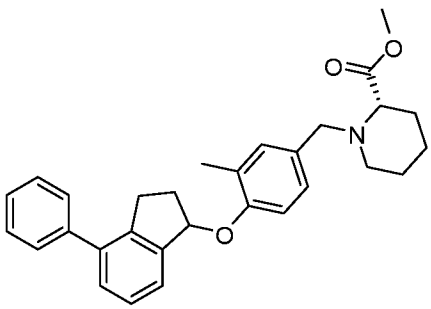
crude residue was purified by silica gel chromatography eluting with 20% ethyl acetate in hexanes to give desired product. LC-MS calculated for $C_{15}H_{13}$ $(M-H_2O)^+$: m/z = 193.1; 193.1:

Step 2: (S)-methyl 1-(4-hydroxy-3-methylbenzyl)piperidine-2-carboxylate



To a solution of 4-hydroxy-3-methylbenzaldehyde (*Aldrich cat# 316911:* 400.0 mg, 2.938 mmol) and N,N-diisopropylethylamine (8.8 mmol) in 1,2-dichloroethane (200 mmol) was added (S)-methyl piperidine-2-carboxylate hydrochloride (*Combi-Blocks cat# SS-2950:* 690 mg, 3.8 mmol) followed by sodium triacetoxyborohydride (1.9 g, 8.8 mmol). The mixture was stirred at room temperature overnight. The crude reaction mixture was diluted with DCM, then sequentially washed with an aqueous $NaHCO_3$ solution, water, and brine. The organic layer was dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting with 40% ethyl acetate in hexanes to give the desired product. LC-MS calculated for $C_{15}H_{22}NO_3$ $(M+H)^+$: m/z = 264.2; found: 264.2

Step 3: (2S)-methyl 1-(3-methyl-4-(4-phenyl-2,3-dihydro-1H-inden-1-yloxy)benzyl)piperidine-2-carboxylate



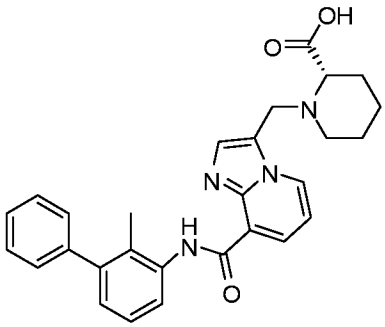
To a solution of methyl (S)-1-(4-hydroxy-3-methylbenzyl)piperidine-2-carboxylate (115 mg, 0.437 mmol), 4-phenylindan-1-ol (91.8 mg, 0.437 mmol), and triphenylphosphine (230 mg, 0.87 mmol) in toluene (5 ml) at room temperature was added diethyl azodicarboxylate (0.66 mmol) dropwise. The reaction mixture was stirred at 70°C for 4 hours after which time the crude reaction mixture was concentrated under reduced pressure. The

crude residue was purified by silica gel chromatography eluting with 20% ethyl acetate in hexanes to give the desired product. LC-MS calculated for $C_{30}H_{34}NO_3$ $(M+H)^+$: m/z = 456.3; found: 456.1

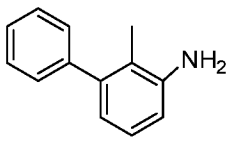
Step 4: (2S)-1-(3-methyl-4-(4-phenyl-2,3-dihydro-1H-inden-1-yloxy)benzyl)piperidine-2-carboxylic acid

To a mixture of (2S)-methyl 1-(3-methyl-4-(4-phenyl-2,3-dihydro-1H-inden-1-yloxy)benzyl)piperidine-2-carboxylate (18 mg, 0.040 mmol) in THF (1 ml) and Methanol (1 ml) was added lithium hydroxide hydrate (20 mg, 0.4 mmol) and water(0.4mL). The resulting mixture was stirred at r.t. overnight. The crude reaction mixture was diluted with methanol and purified by prep-HPLC (pH = 10, acetonitrile/water+NH_4OH) to provide the desired compound as a white powder. LC-MS calculated for $C_{29}H_{32}NO_3$ $(M+H)^+$: m/z = 442.2; found 442.2.

Example 11: (S)-1-((8-(2-methylbiphenyl-3-ylcarbamoyl)imidazo[1,2-a]pyridin-3-yl)methyl)piperidine-2-carboxylic acid



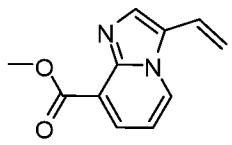
Step 1: 2-methylbiphenyl-3-amine



To a solution of 3-bromo-2-methylaniline (*Aldrich cat#530018:* 1.0 g, 5.4 mmol) in water (3 ml) and 1,4-dioxane (10 ml) was added phenylboronic acid (*Aldrich cat# P20009:* 0.79 g, 6.4 mmol), [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (0.3 g, 0.3 mmol) and sodium carbonate (1.2 g, 11 mmol). The reaction mixture was degassed with nitrogen and then heated at 100°C for 3 hours. The crude reaction mixture was then cooled to rt and filtered over celite. The filtrate was concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting

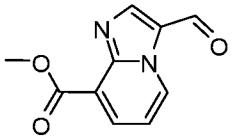
with 20% ethyl acetate in hexanes to give desired product. LC-MS calculated for $C_{13}H_{14}N$ $(M+H)^+$: m/z = 184.1; found: 184.1

Step 2: methyl 3-vinylimidazo[1,2-a]pyridine-8-carboxylate



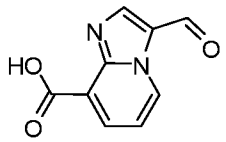
A mixture of methyl 3-bromoimidazo[1,2-a]pyridine-8-carboxylate (*Combi-Blocks cat# HC-2497:* 350 mg, 1.4 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (2.0 mmol), [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (0.07 g, 0.08 mmol) and potassium carbonate (600 mg, 4 mmol) in 1,4-dioxane (15 mL) and water (3 mL) was purged with nitrogen and then heated at 100°C for 2 hours. The crude reaction mixture was cooled to room temperature and then filtered over celite. The filtrate was concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting with 60% ethyl acetate in DCM to give the desired product. LC-MS calculated for $C_{11}H_{11}N_2O_2$ $(M+H)^+$: m/z = 203.1; found: 203.1

Step 3: methyl 3-formylimidazo[1,2-a]pyridine-8-carboxylate



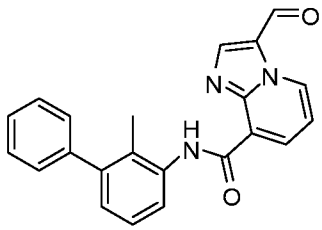
To a solution of methyl 3-vinylimidazo[1,2-a]pyridine-8-carboxylate (200.0 mg, 0.9891 mmol) in 1,4-dioxane (10 ml) and water (2ml) was added, 2,6-lutidine (0.46ml, 4.0 mmol), followed by a solution of osmium tetroxide in water (1mL, 0.15 mmol). The crude reaction mixture was stirred for 10 min at room temperature after which time sodium periodate (630 mg, 3.0 mmol) as a solution in water (1.5 mL) was added. The reaction mixture was stirred at r.t. for 3 hours. The crude reaction suspension was diluted with water then extracted with EtOAc. The combined organic layers were washed with water and brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting with 50% ethyl acetate in DCM to give desired product. LC-MS calculated for $C_{10}H_9N_2O_3$ $(M+H)^+$: m/z = 205.1; found: 205.2

Step 4: 3-formylimidazo[1,2-a]pyridine-8-carboxylic acid



To a mixture of methyl 3-formylimidazo[1,2-a]pyridine-8-carboxylate (56.0 mg, 0.274 mmol) in THF (2 ml) and methanol (1 ml) was added lithium hydroxide hydrate (46 mg, 1.1 mmol) and water (0.4 mL). The resulting mixture was stirred at room temperature for 1 hour. The crude reaction mixture was acidified with small amount 1N HCl solution, then extracted with DCM. The combined organic layers were dried over Na_2SO_4, filtered, and concentrated under reduced pressure to afford the desired compound which was taken on without further purification. LC-MS calculated for $C_9H_7N_2O_3$ $(M+H)^+$: m/z = 191.0; found: 191.1

Step 5: 3-formyl-N-(2-methylbiphenyl-3-yl)imidazo[1,2-a]pyridine-8-carboxamide



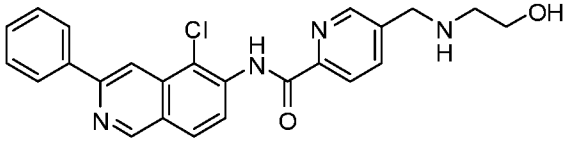
To the solution of 3-formylimidazo[1,2-a]pyridine-8-carboxylic acid (60 mg, 0.3 mmol) and 2-methylbiphenyl-3-amine (*Example 11, Step 1:* 63.6 mg, 0.347 mmol) in N,N-dimethylformamide (3 ml) was added N,N,N',N'-Tetramethyl-O-(7-azabenzotriazol-1-yl)uronium hexafluorophosphate (180 mg, 0.47 mmol), followed by N,N-diisopropylethylamine (0.95 mmol). The crude reaction mixture was stirred for 3 hours at room temperature. The crude reaction mixture was diluted with DCM, then washed sequentially with aqueous $NaHCO_3$ solution, water, and brine. The organic layer was dried over Na_2SO_4, filtered, and concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting with 15% ethyl acetate in hexanes to give desired product. LC-MS calculated for $C_{22}H_{18}N_3O_2$ $(M+H)^+$: m/z = 356.1; found: 356.1

Step 6: (S)-1-((8-(2-methylbiphenyl-3-ylcarbamoyl)imidazo[1,2-a]pyridin-3-yl)methyl)piperidine-2-carboxylic acid

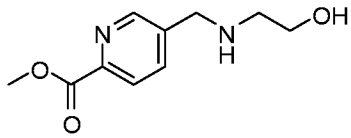
To a solution of 3-formyl-N-(2-methylbiphenyl-3-yl)imidazo[1,2-a]pyridine-8-carboxamide (10.0 mg, 0.028 mmol) in 1,2-dichloroethane (1 ml) was added acetic acid (0.14 mmol) and (2S)-piperidine-2-carboxylic acid (*Aldrich cat#P2519:* 7.3 mg, 0.056

mmol). The mixture was allowed to stir at room temperature for 20 min after which time sodium triacetoxyborohydride (18 mg, 0.084 mmol) was added and was allowed to stir overnight. The crude reaction mixture was concentrated to dryness under reduced pressure and the residue was dissolved with MeOH, and purified by prep-HPLC (pH = 10, acetonitrile/water+NH_4OH) to provide the desired compound as a white powder. LC-MS calculated for $C_{28}H_{29}N_4O_3$ $(M+H)^+$: m/z = 469.2; found: 469.2

Example 12: N-(5-chloro-3-phenylisoquinolin-6-yl)-5-((2-hydroxyethylamino)methyl) picolinamide

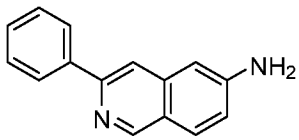


Step 1: methyl 5-((2-hydroxyethylamino)methyl)picolinate



To a solution of methyl 5-formylpicolinate (*AstaTech cat#68601:* 525.0 mg, 3.179 mmol) in methanol (15 ml) was added ethanolamine (0.23 ml, 3.81 mmol). The reaction mixture was stirred at r.t. 30 min, then Pd/C 10% (50mg) was added. The suspension was stirred at room temperature under an atmosphere of hydrogen for 1 hour. The suspension was filtered over silica gel and the filtrate was concentrated to dryness. The crude residue was purified by silica gel chromatography eluting with 15% MeOH in DCM to give desired product. LC-MS calculated for $C_{10}H_{15}N_2O_3$ $(M+H)^+$: m/z = 211.1; found: 211.1

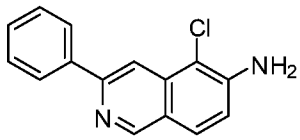
Step 2: 3-phenylisoquinolin-6-amine



A mixture of Phenylboronic acid (*Aldrich cat#P20009:* 270 mg, 2.2 mmol), 3-chloroisoquinolin-6-amine (*ArkPharm cat#AK476767:* 200.0 mg, 1.120 mmol), sodium carbonate (300 mg, 2.8 mmol) and bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (85 mg, 0.11 mmol) in tert-butyl alcohol (7 mL) and water (7mL) was degassed with nitrogen, then heated at 105°C overnight.

The crude reaction mixture was cooled to room temperature and filtered over celite and concentrated under reduced pressure. The crude residue was purified by silica gel chromatography eluting with 20% ethyl acetate in DCM to give the desired product. LC-MS calculated for $C_{15}H_{13}N_2$ $(M+H)^+$: m/z = 221.1; found: 221.1

Step 3: 5-chloro-3-phenylisoquinolin-6-amine

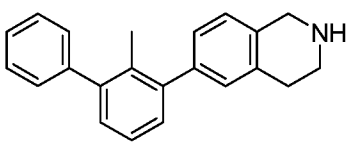


To a solution of 3-phenylisoquinolin-6-amine (50.0 mg, 0.227 mmol) in acetonitrile (5 ml) was added N-chlorosuccinimide (33.3 mg, 0.250 mmol) and was stirred at room temperature for 4 hours. The crude reaction mixture was concentrated to dryness. The residue was dissolved in DCM and washed sequentially with water and brine. The organic layer was dried over Na_2SO_4, filtered, and concentrated under reduced pressure to give the desired product which was taken on without further purification. LC-MS calculated for $C_{15}H_{12}ClN_2$ $(M+H)^+$: m/z = 255.1; found: 255.1

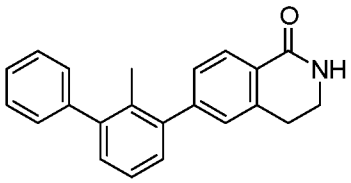
Step 4: N-(5-chloro-3-phenylisoquinolin-6-yl)-5-((2-hydroxyethylamino)methyl)picolinamide

To the solution of 5-chloro-3-phenylisoquinolin-6-amine (70.0 mg, 0.275 mmol) in tetrahydrofuran (2 ml) was added 1.0 M sodium hexamethyldisilazane in THF (0.316 mmol) at 0°C and was allowed to stir for 30 min. To the stirring solution was then dropwise added ethyl 5-{[(2-hydroxyethyl)amino]methyl}pyridine-2-carboxylate (62 mg, 0.27 mmol) as a solution in THF (1mL) and was stirred at room temperature for 2 hours. Water was added to quench the reaction and the crude reaction mixture was concentrated to dryness under reduced pressure. The residue was dissolved in MeOH, and was purified by prep-HPLC (pH = 2, acetonitrile/water+TFA) to provide the desired compound as a white powder. LC-MS calculated for $C_{24}H_{22}ClN_4O_2$ $(M+H)^+$: m/z = 433.1; found: 433.1

Example 13: 6-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinoline



Step 1: 6-(2-methylbiphenyl-3-yl)-3,4-dihydroisoquinolin-1(2H)-one

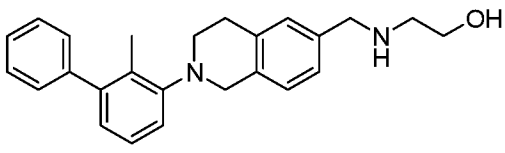


A mixture of 3-bromo-2-methylbiphenyl (*Example 2, Step 1:* 40 mg, 0.2 mmol), 6-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-3,4-dihydroisoquinolin-1(2H)-one (*Combi-Blocks cat# FM-2421:* 53 mg, 0.19 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (7 mg, 0.008 mmol) and potassium carbonate (67 mg, 0.48 mmol) in 1,4-dioxane (2 mL) and water (1 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 120 °C overnight. The reaction mixture was quenched with water, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the crude product. LC-MS calculated for $C_{22}H_{20}NO$ $(M+H)^+$: m/z = 314.2; found: 314.1.

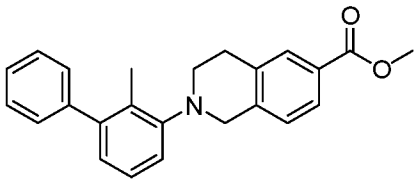
Step 2: 6-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinoline

1.0 M Lithium tetrahydroaluminate in THF (0.48 mL) was added to a solution of the above product in THF (2mL). The reaction mixture was stirred at 50 °C for 2h. The reaction was cooled to room temperature and the reaction mixture was quenched with saturated aqueous NH_4Cl, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{22}H_{22}N$ $(M+H)^+$: m/z = 300.2; found: 300.2

Example 14: 2-((2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl)methylamino)ethanol

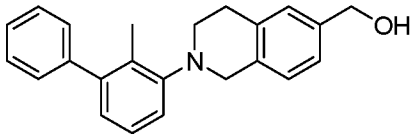


Step 1: methyl 2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinoline-6-carboxylate



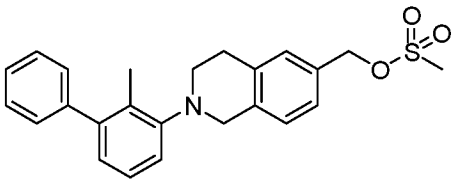
To a mixture of 3-bromo-2-methylbiphenyl (*Example 2, Step 1:* 270 mg, 1.09 mmol), palladium acetate (24 mg, 0.11 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (68 mg, 0.11 mmol), and cesium carbonate (1100 mg, 3.3 mmol) in 1,4-dioxane (10 mL) was added methyl 1,2,3,4-tetrahydroisoquinoline-6-carboxylate (*AstaTech cat#F51533:* 230 mg, 1.2 mmol) under N_2. The reaction mixture was stirred at 120 °C overnight. The crude reaction mixture was cooled to room temperature, was diluted with ethyl acetate, filtered, and concentrated under reduced pressure. The crude residue was purified by flash chromatography on a silica gel column with ethyl acetate in hexanes (0-30%) to afford the desired product. LC-MS calculated for $C_{24}H_{24}NO_2$ $(M+H)^+$: m/z = 358.2; found: 358.1.

Step 2: (2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl)methanol



1.0 M Lithium tetrahydroaluminate in THF (2.2 mL) was added to a solution of the above product in THF (5 mL). The reaction mixture was stirred at room temperature for 2h. The reaction mixture was quenched with saturated aqueous NH_4Cl, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel column with ethyl acetate in hexanes (0-30%) to afford the desired product. LC-MS calculated for $C_{23}H_{24}NO$ $(M+H)^+$: m/z = 330.2; found: 330.2.

Step 3: (2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl)methyl methanesulfonate

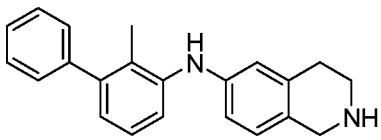


Methanesulfonyl chloride (0.32 mmol) was added to solution of [2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl]methanol (96 mg, 0.29 mmol) and N,N-diisopropylethylamine (0.44 mmol) in methylene chloride at 0 °C. The reaction mixture was stirred at room temperature for 30 min, then quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the desired product. LC-MS calculated for $C_{24}H_{26}NO_3S$ $(M+H)^+$: m/z = 408.2; found: 408.1.

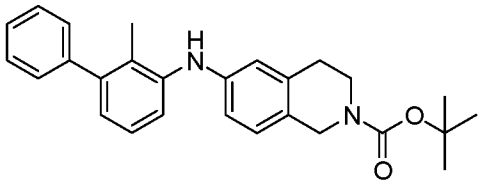
Step 4: 2-((2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl)methylamino)ethanol

Ethanolamine (4.5 mg, 0.073 mmol) was added to solution of [2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl]methyl methanesulfonate (15 mg, 0.037 mmol) and N,N-diisopropylethylamine (0.1 mmol) in N,N-dimethylformamide. The reaction mixture was stirred at 60 °C for 6h. The mixture was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{25}H_{29}N_2O$ $(M+H)^+$: m/z 373.2; found: 373.2.

Example 15: N-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-amine



Step 1: tert-butyl 6-(2-methylbiphenyl-3-ylamino)-3,4-dihydroisoquinoline-2(1H)-carboxylate



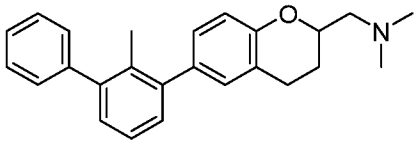
To a mixture of 3-bromo-2-methylbiphenyl (*Example 2, Step1:* 30 mg, 0.1 mmol), palladium acetate (2.7 mg, 0.012 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (7.6 mg, 0.012 mmol), and cesium carbonate (120 mg, 0.37 mmol) in 1,4-dioxane was added tert-butyl 6-amino-3,4-dihydroisoquinoline-2(1H)-carboxylate (*Oakwood cat#011348:* 33 mg, 0.13 mmol) under N_2. The reaction mixture was stirred at 120 °C overnight. The crude reaction mixture was cooled to room temperature, diluted with ethyl acetate, filtered and concentrated under reduced pressure. The residue was purified by flash

chromatography on a silica gel column with ethyl acetate in hexanes (0-20%) to afford the desired product. LC-MS calculated for $C_{27}H_{31}N_2O_2$ $(M+H)^+$: m/z 415.2; found: 415.2.

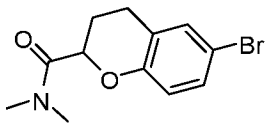
Step 2: N-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-amine

To a solution of the above compound in DCM (1mL) was added TFA (1 mL). The reaction mixture was stirred at room temperature for 1h. The crude reaction mixture was concentrated under reduced pressure. The isolated residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{22}H_{23}N_2$ $(M+H)^+$: m/z 315.2; found: 315.2.

Example 16: N,N-dimethyl-1-(6-(2-methylbiphenyl-3-yl)chroman-2-yl)methanamine

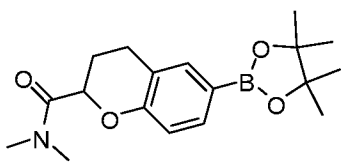


Step 1: 6-bromo-N,N-dimethylchroman-2-carboxamide



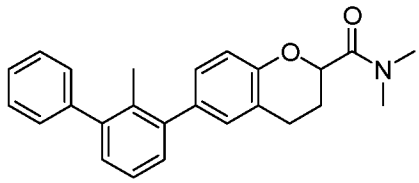
To a mixture of 6-bromochromane-2-carboxylic acid (*Combi-Blocks cat#QB-8533:* 0.38 g, 1.5 mmol) and 2.0 M Dimethylamine in THF (2.2 mmol) in DMF (3mL) was added Benzotriazol-1-yloxy)tripyrrolidinophosphonium hexafluorophosphate (940 mg, 1.8 mmol) followed by N,N-Diisopropylethylamine (2.2 mmol). The reaction mixture was stirred at room temperature for 2 hours. The crude reaction mixture was quenched with water and extracted with ethyl acetate. The combined organic layers were washed with brine, dried over magnesium sulfate, concentrated under reduced pressure, and used without further purification. LC-MS calculated for $C_{12}H_{15}BrNO_2$ $(M+H)^+$: m/z 284.0; found: 284.0, 286.0.

Step 2: N,N-dimethyl-6-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)chromane-2-carboxamide



A mixture of 6-bromo-N,N-dimethylchromane-2-carboxamide (0.43 g, 1.5 mmol), 4,4,5,5,4',4',5',5'-Octamethyl-[2,2']bi[[1,3,2]dioxaborolanyl] (580 mg, 2.3 mmol), [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (60 mg, 0.08 mmol), and potassium acetate (440 mg, 4.5 mmol) in 1,4-dioxane (200 mmol) was degassed and heated at 90°C overnight. The crude reaction mixture was cooled to room temperature and concentrated under reduced pressure. The crude material was purified by flash column chromatography using 50% ethyl acetate in hexanes. LC-MS calculated for $C_{18}H_{27}BNO_4$ $(M+H)^+$: m/z 332.2; found: 332.2.

Step 3: N,N-dimethyl-6-(2-methylbiphenyl-3-yl)chroman-2-carboxamide

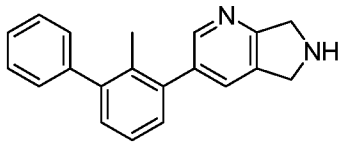


A mixture of 3-bromo-2-methylbiphenyl (*Example 2, Step 1:* 40 mg, 0.2 mmol), N,N-dimethyl-6-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)chromane-2-carboxamide (64 mg, 0.19 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (7 mg, 0.008 mmol) and potassium carbonate (67 mg, 0.48 mmol) in 1,4-dioxane (4 mL) and water (2 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 120 °C overnight. The reaction mixture was quenched with water, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the crude product. LC-MS calculated for $C_{25}H_{26}NO_2$ $(M+H)^+$: m/z 372.2; found: 372.2.

Step 4: N,N-dimethyl-1-(6-(2-methylbiphenyl-3-yl)chroman-2-yl)methanamine

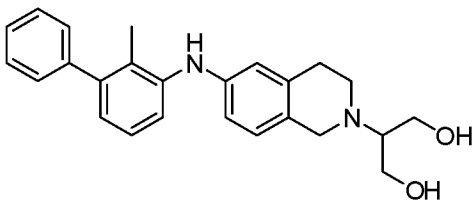
1.0 M Lithium tetrahydroaluminate in THF (0.32 mL) was added to a solution of the above product in THF (2mL). The reaction mixture was stirred at 50 °C for 2h. The crude reaction mixture was cooled to room temperature and was quenched with saturated aqueous NH_4Cl, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{25}H_{28}NO$ $(M+H)^+$: m/z 358.2; found: 358.2.

Example 17: 3-(2-methylbiphenyl-3-yl)-6,7-dihydro-5H-pyrrolo[3,4-b]pyridine



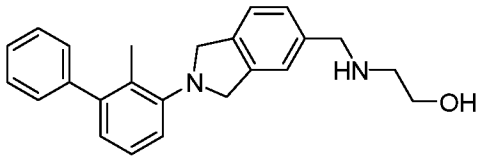
A mixture of 4,4,5,5-tetramethyl-2-(2-methylbiphenyl-3-yl)-1,3,2-dioxaborolane (*Example 4, Step 1:* 50 mg, 0.2 mmol), 3-bromo-6,7-dihydro-5H-pyrrolo[3,4-b]pyridine (*Synthonix cat#B11679:* 37 mg, 0.19 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (7 mg, 0.008 mmol) and potassium carbonate (70. mg, 0.51 mmol) in 1,4-dioxane (4 mL) and water (2 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 120 °C overnight. The reaction mixture was quenched with water, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the crude product. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{20}H_{19}N_2$ $(M+H)^+$: m/z 287.2; found: 287.2.

Example 18: 2-(6-(2-methylbiphenyl-3-ylamino)-3,4-dihydroisoquinolin-2(1H)-yl)propane-1,3-diol

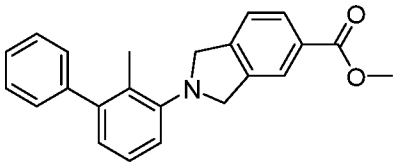


1,3-Dihydroxy-2-propanone (5.0 mg, 0.055 mmol) was added to a solution of N-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-amine (TFA salt) (*Example 15:* 13 mg, 0.03 mmol) in N,N-dimethylformamide. The reaction mixture was stirred at room temperature for 10 min. Acetic acid (0.070 mmol) was added followed by sodium cyanoborohydride (8.9 mg, 0.14 mmol). The reaction mixture was allowed to stir overnight. The crude reaction mixture was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{25}H_{29}N_2O_2$ $(M+H)^+$: m/z 389.2; found: 389.2.

Example 19: 2-((2-(2-methylbiphenyl-3-yl)isoindolin-5-yl)methylamino)ethanol

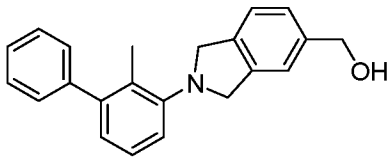


Step 1: methyl 2-(2-methylbiphenyl-3-yl)isoindoline-5-carboxylate



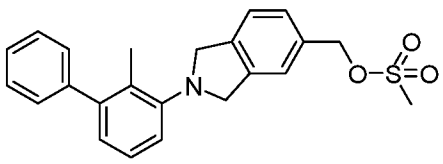
To a mixture of 3-bromo-2-methylbiphenyl (*Example 2, Step 1:* 0.20 g, 0.81 mmol), Palladium Acetate (17 mg, 0.075 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (47 mg, 0.075 mmol), and cesium carbonate (0.73 g, 2.2 mmol) in 1,4-dioxane (1mL) was added methyl isoindoline-5-carboxylate hydrochloride (*AstaTech cat#63466:* 0.16 g, 0.75 mmol) under N_2. The reaction mixture was stirred at 110 °C overnight. After the crude reaction mixture was cooled to room temperature the reaction mixture was diluted with ethyl acetate, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel column with ethyl acetate in hexanes (0-10%) to afford the desired product. LC-MS calculated for $C_{23}H_{22}NO_2$ $(M+H)^+$: m/z 344.2; found: 344.3.

Step 2: (2-(2-methylbiphenyl-3-yl)isoindolin-5-yl)methanol



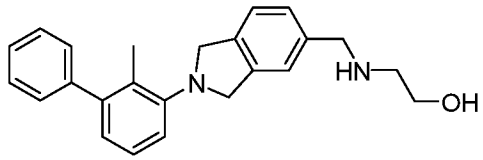
To a solution of the above product in THF (4 mL) was added 1.0 M Lithium tetrahydroaluminate in THF (1.1 mL). The reaction mixture was stirred at room temperature for 2h. The crude reaction mixture was quenched with saturated aqueous NH_4Cl, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered, and concentrated under reduced pressure to afford the desired product. LC-MS calculated for $C_{22}H_{22}NO$ $(M+H)^+$: m/z 316.2; found: 316.1.

Step 3: (2-(2-methylbiphenyl-3-yl)isoindolin-5-yl)methyl methanesulfonate



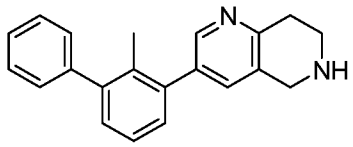
Methanesulfonyl chloride (0.48 mmol) was added to solution of [2-(2-methylbiphenyl-3-yl)-2,3-dihydro-1H-isoindol-5-yl]methanol (101 mg, 0.320 mmol) and N,N-diisopropylethylamine (0.48 mmol) in dethylene chloride at 0 °C. The reaction mixture was stirred at room temperature for 30 min after which time the crude reaction mixture was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the desired product. LC-MS calculated for $C_{23}H_{24}NO_3S$ $(M+H)^+$: m/z 394.1; found: 394.2.

Step 4: 2-((2-(2-methylbiphenyl-3-yl)isoindolin-5-yl)methylamino)ethanol



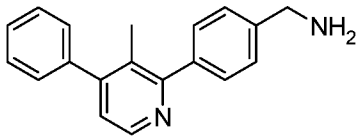
Ethanolamine (39 mg, 0.64 mmol) was added to a mixture of the above product and N,N-diisopropylethylamine (0.48 mmol) in DMF (2mL). The reaction mixture was stirred at 60 °C for 2h. The mixture was adjusted to pH2 with TFA, and purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{24}H_{27}N_2O$ $(M+H)^+$: m/z 359.2; found: 359.2.

Example 20: 3-(2-methylbiphenyl-3-yl)-5,6,7,8-tetrahydro-1,6-naphthyridine

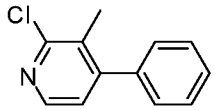


A mixture of 4,4,5,5-tetramethyl-2-(2-methylbiphenyl-3-yl)-1,3,2-dioxaborolane (*Example 4, Step 1:* 20 mg, 0.07 mmol), 3-bromo-5,6,7,8-tetrahydro-1,6-naphthyridine hydrochloride (*AstaTech cat# SC2711:* 17 mg, 0.068 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (3 mg, 0.003 mmol) and potassium carbonate (28 mg, 0.20 mmol) in 1,4-dioxane (1 mL) and water (0.5 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 110 °C overnight. The crude reaction mixture was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{21}H_{21}N_2$ $(M+H)^+$: m/z 301.2; found: 301.2.

Example 21: (4-(3-methyl-4-phenylpyridin-2-yl)phenyl)methanamine



Step 1: 2-chloro-3-methyl-4-phenylpyridine

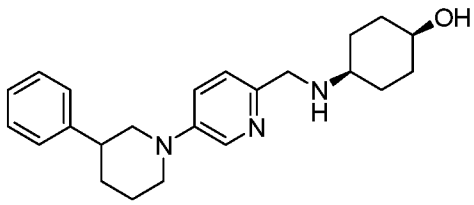


To a solution of 2-chloro-4-iodo-3-methylpyridine (*Aldrich cat#724092:* 303 mg, 1.20 mmol), phenylboronic acid (160 mg, 1.32 mmol), and sodium carbonate (317 mg, 2.99 mmol) in tert-butyl alcohol (9.5 mL) and Water (5.4 mL) was added bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (181 mg, 0.239 mmol). The reaction was purged with N2, then heated to 80°C. The crude reaction mixture was cooled to room temperature after 2 hours. The crude reaction mixture was diluted with water and extracted with DCM. The combined organic layers were washed with brine, dried over magnesium sulfate, and concentrated under reduced pressure. The crude residue was purified by column chromatography (0~20% ethyl acetate in hexanes). LC-MS calculated for $C_{12}H_{11}ClN$ $(M+H)^+$: m/z 204.1; found: 204.2.

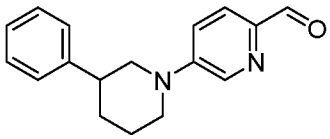
Step 2: (4-(3-methyl-4-phenylpyridin-2-yl)phenyl)methanamine

A mixture of 2-chloro-3-methyl-4-phenylpyridine (20 mg, 0.1 mmol), [4-(aminomethyl)phenyl]boronic acid hydrochloride (*Combi-Blocks cat# BB-2443:* 22 mg, 0.12 mmol), [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II),complex with dichloromethane (1:1) (7 mg, 0.008 mmol) and potassium carbonate (70. mg, 0.51 mmol) in 1,4-dioxane (1 mL) and water (0.5 mL) was degassed and recharged with nitrogen three times. The mixture was then heated and stirred at 110 °C overnight. The reaction mixture was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{19}H_{19}N_2$ $(M+H)^+$: m/z 275.2; found: 275.2.

Example 22: Cis-4-((5-(3-phenylpiperidin-1-yl)pyridin-2-yl)methylamino)cyclohexanol



Step 1: 5-(3-phenylpiperidin-1-yl)picolinaldehyde

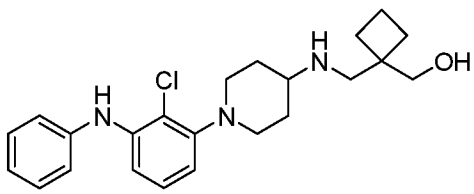


To a mixture of 5-bromopyridine-2-carbaldehyde (*Combi-Blocks cat#CA-4232:* 0.16 g, 0.86 mmol), palladium acetate (18 mg, 0.080 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (50. mg, 0.080 mmol), and cesium carbonate (0.78 g, 2.4 mmol) in 1,4-dioxane (1 mL) was added 3-phenylpiperidine (*Oakwood cat# 019443:* 0.13 g, 0.80 mmol) under N_2. The reaction mixture was stirred at 110 °C overnight. After the crude reaction mixture was cooled to room temperature it was diluted with ethyl acetate, filtered, and concentrated under reduced pressure to afford the crude product which was taken on without further purification. LC-MS calculated for $C_{17}H_{19}N_2O$ $(M+H)^+$: m/z 267.1; found: 267.1.

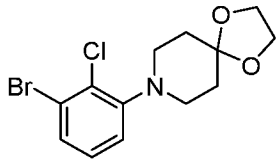
Step 2: Cis-4-((5-(3-phenylpiperidin-1-yl)pyridin-2-yl)methylamino)cyclohexanol

Cis-4-Aminocyclohexanol hydrochloride (*Aldrich cat# 740365:* 8.3 mg, 0.055 mmol) was added to a solution of 5-(3-phenylpiperidin-1-yl)pyridine-2-carbaldehyde (10 mg, 0.04 mmol) in N,N-dimethylformamide, followed by acetic acid (0.11 mmol). After 5 min, sodium cyanoborohydride (6.9 mg, 0.11 mmol) was added. The reaction mixture was stirred at room temperature overnight. The crude reaction mixture was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{23}H_{32}N_3O$ $(M+H)^+$: m/z 366.3; found: 366.3.

Example 23: (1-((1-(2-chloro-3-(phenylamino)phenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol

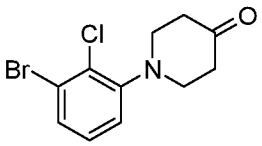


Step 1: 8-(3-bromo-2-chlorophenyl)-1,4-dioxa-8-azaspiro[4.5]decane



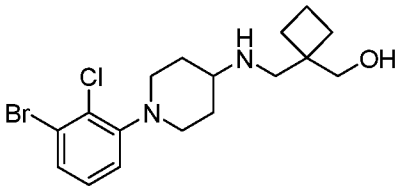
To a mixture of 1,3-dibromo-2-chlorobenzene (*Combi-Blocks cat#QA-2717:* 2.2 g, 8.14 mmol), $Pd(OAc)_2$ (0.183 g, 0.814 mmol) and cesium carbonate (6.63 g, 20.34 mmol) in 1,4-dioxane (30 ml) was added 1,4-dioxa-8-azaspiro[4.5]decane (*Aldrich cat# 178365:* 1.165 g, 8.14 mmol) under N_2. The reaction mixture was stirred at 90 °C overnight. After the reaction was cooled to room temperature it was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel column with ethyl acetate in hexanes (0-20%) to afford the desired product. LC-MS calculated for $C_{13}H_{16}BrClNO_2$ $(M+H)^+$: m/z 332.0; found: 332.0/334.0.

Step 2: 1-(3-bromo-2-chlorophenyl)piperidin-4-one



To a solution of the above product in acetone (4 mL) was added 1N HCl (4 mL) in water and MeOH (4mL). The reaction mixture was stirred at 40 °C overnight. The reaction mixture was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure to afford the desired product. LC-MS calculated for $C_{11}H_{12}BrClNO$ $(M+H)^+$: m/z 288.0; found: 288.0/290.0.

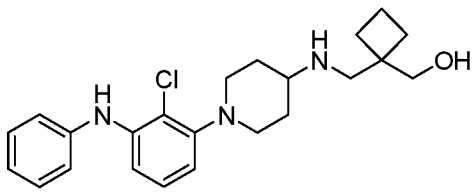
Step 3: (1-((1-(3-bromo-2-chlorophenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol



(1-(Aminomethyl)cyclobutyl)methanol (*Combi-Blocks cat# AM-2310:* 0.369 g, 3.20 mmol) was added to a solution of 1-(3-bromo-2-chlorophenyl)piperidin-4-one (0.77 g, 2.67

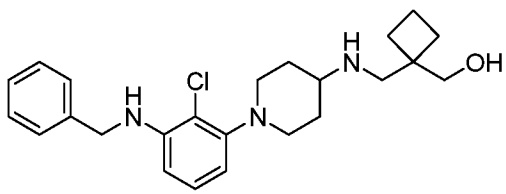
mmol) in N,N-dimethylformamide (10 ml), followed by acetic acid (0.611 ml, 10.67 mmol). After 5 min, sodium cyanoborohydride (0.335 g, 5.34 mmol) was added. The reaction mixture was stirred at room temperature overnight. The mixture was quenched with sat. $NaHCO_3$, extracted with ethyl acetate (3x20 mL), washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel column with MeOH in DCM (0-5%) to afford the desired product. LC-MS calculated for $C_{17}H_{25}BrClN_2O$ $(M+H)^+$: m/z 387.1; found: 387.0/389.1/391.0.

Step 4: (1-((1-(2-chloro-3-(phenylamino)phenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol



To a mixture of(1-(((1-(3-bromo-2-chlorophenyl)piperidin-4-yl)amino)methyl)cyclobutyl)methanol (20 mg, 0.052 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (3.21 mg, 5.16 µmol), and cesium carbonate (42.0 mg, 0.129 mmol) in1,4-dioxane (1 ml) was added aniline (7.21 mg, 0.077 mmol) under N_2. The reaction mixture was stirred at 120 °C overnight. After the reaction mixture was cooled to room temperature it was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{23}H_{31}ClN_3O$ $(M+H)^+$: m/z 400.2; found:400.2.

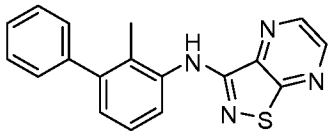
Example 24: (1-((1-(3-(benzylamino)-2-chlorophenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol



To a mixture of (1-(((1-(3-bromo-2-chlorophenyl)piperidin-4-yl)amino)methyl)cyclobutyl)methanol (*Example 23, Step 3:* 20 mg, 0.052 mmol), (R)-(+)-

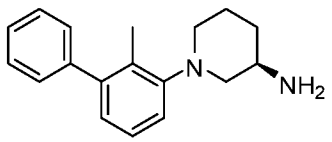
2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (3.21 mg, 5.16 µmol), and cesium carbonate (42.0 mg, 0.129 mmol) in1,4-Dioxane (1 ml) was added phenylmethanamine (8.29 mg, 0.077 mmol) under N_2. The reaction mixture was stirred at 120 °C overnight. After the reaction mixture was cooled to room temperature it was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 50 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The residue was purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{24}H_{33}ClN_3O$ $(M+H)^+$: m/z 414; found:414.2.

Example 25: N-(2-methylbiphenyl-3-yl)isothiazolo[4,5-b]pyrazin-3-amine



A mixture of 3-bromoisothiazolo[4,5-b]pyrazine (Ark Pharm, cat#AK-30773: 17 mg, 0.080 mmol), 2-methylbiphenyl-3-amine (*Example 11, Step 1:* 14.7 mg, 0.080 mmol), [(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-triisopropyl-1,1'-biphenyl)-2-(2'-amino-1,1'-biphenyl)]palladium(II) methanesulfonate (BrettPhos Pd G3, 11 mg, 0.012 mmol), and cesium carbonate (130 mg, 0.40 mmol) in tert-butyl alcohol was purged with nitrogen, and then stirred at 100 °C for 2 h. After being cooled to room temperature, the crude reaction mixture was diluted with methanol and purified by prep HPLC (pH = 2, acetonitrile/water+TFA) to provide the desired compound as the TFA salt. LC-MS calculated for $C_{18}H_{15}N_4S$ $(M+H)^+$: m/z = 319.1; found 319.2.

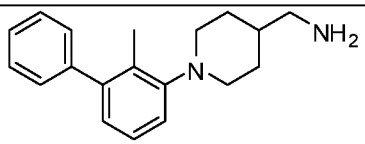
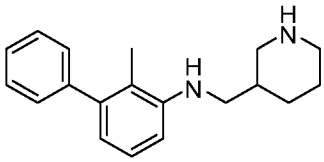
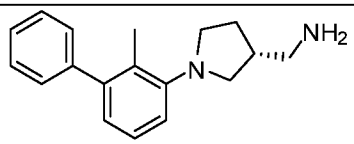
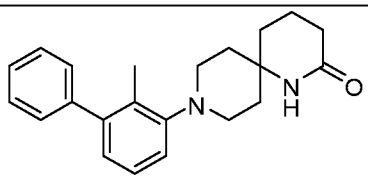
Example 26: (R)-1-(2-methylbiphenyl-3-yl)piperidin-3-amine



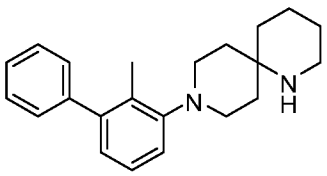
A stirred mixture of tert-butyl (3R)-piperidin-3-ylcarbamate (*Combi-Blocks Cat#AM-1743:* 0.016 g, 0.081 mmol), 3-bromo-2-methylbiphenyl (*Example 2, Step 1:* 10.0 mg, 0.0405 mmol), (2'-aminobiphenyl-2-yl)(chloro)[dicyclohexyl(2',6'-diisopropoxybiphenyl-2-yl)phosphoranyl]palladium (3.09 mg, 0.00397 mmol), sodium tert-butoxide (7.64 mg, 0.0795 mmol) in 1,4-dioxane (2.0 mL) was heated at 110°C under the atmosphere of N_2 overnight. The reaction was quenched with water, and extracted with ethyl acetate (3x 10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and

concentrated under reduced pressure. The residue was dissolved in DCM/TFA (0.5 mL/ 0.5 mL) and stirred at room temperature for 1 h. The volatiles were removed under reduced pressure and the crude product was purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{18}H_{23}N_2$ $(M+H)^+$: m/z = 267.2; found 267.2.

Table 1. The compounds in **Table 1** were prepared in accordance with the synthetic protocols set forth in **Example 26**, using the appropriate starting materials.

Example	Name	Structure	LC-MS (M+H)+
27	(1-(2-methylbiphenyl-3-yl)piperidin-4-yl)methanamine		281.2
28	2-methyl-N-(piperidin-3-ylmethyl)biphenyl-3-amine		281.2
29	(R)-(1-(2-methylbiphenyl-3-yl)pyrrolidin-3-yl)methanamine		267.2
30	9-(2-methylbiphenyl-3-yl)-1,9-diazaspiro[5.5]undecan-2-one		335.2

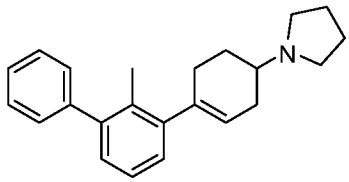
Example 31: 9-(2-methylbiphenyl-3-yl)-1,9-diazaspiro[5.5]undecane



To a stirred solution of 9-(2-methylbiphenyl-3-yl)-1,9-diazaspiro[5.5]undecan-2-one (*Example 30*: 10.0 mg, 0.0299 mmol) in tetrahydrofuran (2 mL), 1.0 M Lithium aluminum hydride in THF (0.18 mL, 0.18 mmol) was added at room temperature. The resulting mixture

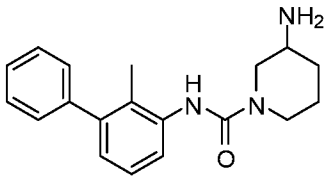
was stirred at room temperature overnight. The reaction was then quenched with saturated aqueous NH_4Cl and extracted with DCM (3 x 10 mL). The combined organic layers were dried over Na_2SO_4 and filtered. The filtrate was concentrated under reduced pressure and the residue was purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{22}H_{29}N_2$ $(M+H)^+$: m/z = 321.2; found 321.2.

Example 32: 1-(4-(2-methylbiphenyl-3-yl)cyclohex-3-enyl)pyrrolidine



A mixture of 1-[4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)cyclohex-3-en-1-yl]pyrrolidine (*Ark Pharm cat#AK141420:* 0.033 g, 0.12 mmol), 3-bromo-2-methylbiphenyl (*Example 2 Step 1:* 0.019 g, 0.079 mmol), sodium carbonate (18.4 mg, 0.173 mmol), and bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (6.0 mg, 0.0079 mmol) in tert-butyl alcohol (1 mL) / water (1 mL) was first degassed with nitrogen, then stirred and heated at 100 °C for 2 hours. The crude reaction mixture was diluted with MeOH and purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{23}H_{28}N$ $(M+H)^+$: m/z = 318.2; found 318.2.

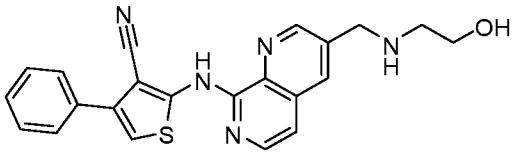
Example 33: 3-amino-N-(2-methylbiphenyl-3-yl)piperidine-1-carboxamide



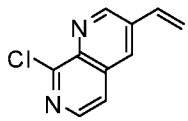
To a solution of triphosgene (8.1 mg, 0.027 mmol) in DCM (2 mL) at 0 °C was added pyridine (4.98 mg, 0.063 mmol). After 10 minutes, a solution of 2-methylbiphenyl-3-amine (*Example 11, step1:* 10.0 mg, 0.0546 mmol) in DCM (3 mL) was added dropwise and was allowed to stir for 1 hour. To the stirring solution was then slowly added *tert*-butyl piperidin-3-ylcarbamate (*Combi Blocks cat#AM-1743:* 0.033 g, 0.16 mmol), followed by the addition of N,N-diisopropylethylamine (14.2 mg, 0.11 mmol). The resulting red suspension was warmed to room temperature and stirred for an additional 2 hours. The crude reaction mixture was then quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3 x 10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and

the filtrate was concentrated under reduced pressure. The residue was dissolved in DCM/TFA(0.5 mL/0.5 mL) and stirred at room temperature for 1 hour. The volatiles were removed and the crude reaction mixture was purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{19}H_{24}N_3O$ $(M+H)^+$: m/z = 310.2; found 310.2.

Example 34: 2-[(3-{[(2-hydroxyethyl)amino]methyl}-1,7-naphthyridin-8-yl)amino]-4-phenylthiophene-3-carbonitrile

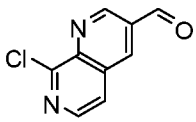


Step 1: 8-chloro-3-vinyl-1,7-naphthyridine



A mixture of 3-bromo-8-chloro-1,7-naphthyridine (*PharmaBlock cat#PBLJ2743:* 0.200 g, 0.821 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (*Aldrich cat#663348:* 153 µL, 0.904 mmol), sodium carbonate (0.174 g, 1.64 mmol) and [1,1′-bis(dicyclohexylphosphino)ferrocene]dichloropalladium(II) (*Aldrich cat#701998:* 6.2 mg, 0.0082 mmol) in tert-butyl alcohol (5.91 mL, 61.8 mmol) and water (6 mL, 300 mmol) was degassed and sealed. It was stirred at 110 °C for 2 h. The reaction mixture was cooled to room temperature then extracted with ethyl acetate (3x 20 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude residue was used directly in the next step without further purification. LC-MS calculated for $C_{10}H_8ClN_2$ $(M+H)^+$: m/z = 191.0; found 191.0.

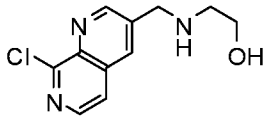
Step 2: 8-chloro-1,7-naphthyridine-3-carbaldehyde



A flask was charged with 8-chloro-3-vinyl-1,7-naphthyridine (391. mg, 2.05 mmol), 1,4-dioxane (40. mL), a stir bar and water (40. mL). To this suspension was added a 4% w/w mixture of osmium tetroxide in water (0.84 mL, 0.132 mmol). The reaction was stirred for 5 min then sodium periodate (3.23 g, 15.11 mmol) was added and stirred for 3 h. The mixture

was diluted with water (20 mL) and EtOAc (20 mL). The layers were separated and the aqueous layer was further extracted with EtOAc (2 X 20 mL). The combined organic extracts were washed with brine, dried over sodium sulfate, filtered, and concentrated under reduced pressure. The crude aldehyde was purified by silica gel chromatography (0 → 60% EtOAc/hexanes). LC-MS calculated for $C_9H_6ClN_2O$ $(M+H)^+$: m/z = 193.0; found 192.9.

Step 3: 2-{[(8-chloro-1,7-naphthyridin-3-yl)methyl]amino}ethanol



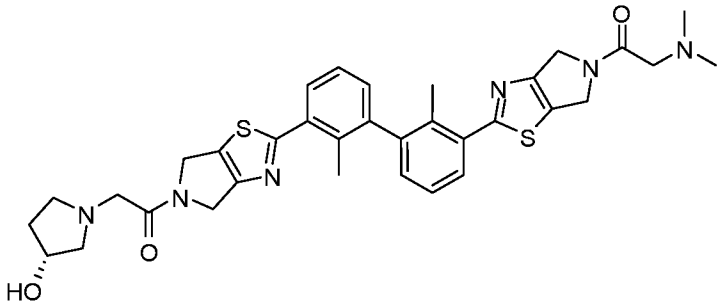
A mixture of 8-chloro-1,7-naphthyridine-3-carbaldehyde (0.160 g, 0.831 mmol) and ethanolamine (*Aldrich cat#398136:* 251 µL, 4.15 mmol) in methylene chloride (6 mL, 100 mmol) and N,N-diisopropylethylamine (868 µL, 4.98 mmol) was stirred at room temperature for 1 h. Sodium triacetoxyborohydride (0.528 g, 2.49 mmol) was carefully added in portions. The reaction was stirred at room temperature for 2 h. To the mixture was then carefully added sodium tetrahydroborate (157 mg, 4.15 mmol) and methanol (1 mL) and the reaction mixture was stirred overnight under nitrogen. The reaction was quenched with a saturated aqueous solution of sodium bicarbonate. The mixture was then extracted with a 3:1 mixture of chlorofom/isopropyl alcohol. The combined organic layers were washed with brine, dried over sodium sulfate, and concentrated in vacuo. The crude residue was purified by column chromatography (0 → 50% methanol/DCM) and was obtained as an off white solid. LC-MS calculated for $C_{11}H_{13}ClN_3O$ $(M+H)^+$: m/z = 238.1; found 238.1.

Step 4: 2-[(3-{[(2-hydroxyethyl)amino]methyl}-1,7-naphthyridin-8-yl)amino]-4-phenylthiophene-3-carbonitrile

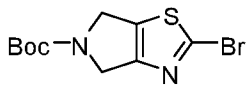
To a vial was added 2-amino-4-phenylthiophene-3-carbonitrile (*Combi-Blocks, cat#QA-7728*: 0.0168 g, 0.0841 mmol), 2-{[(8-chloro-1,7-naphthyridin-3-yl)methyl]amino}ethanol (10.00 mg, 0.04207 mmol), cesium carbonate (0.0274 g, 0.0841 mmol), 1,4-dioxane (12.8 mmol), (9,9-dimethyl-9H-xanthene-4,5-diyl)bis(diphenylphosphine) (4.9 mg, 0.0084 mmol), and tris(dibenzylideneacetone)dipalladium(0) (4.4 mg, 0.0042 mmol). A stir bar was added and the mixture was degassed, sealed, and heated for 2 h at 100 °C. After cooling, the mixture was diluted with methanol and purified by prep HPLC (pH = 2, water+TFA) to

afford the desired compound as the TFA salt. LC-MS calculated for $C_{22}H_{20}N_5OS$ $(M+H)^+$: m/z = 402.1; found 402.2.

Example 35: (R)-2-(dimethylamino)-1-(2-(3'-(5-(2-(3-hydroxypyrrolidin-1-yl)acetyl)-5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)ethanone

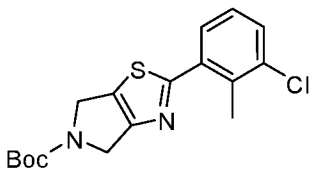


Step1: tert-butyl 2-bromo-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate



To a stirred solution of 2-bromo-5,6-dihydro-4H-pyrrolo[3,4-d]thiazole, HBr (*Aurum Pharm, cat# MR22320:* 220.0 mg, 0.769 mmol) and N,N-diisopropylethylamine (0.269 ml, 1.539 mmol) in DCM (5.0 ml), was added Boc-anhydride (201 mg, 0.923 mmol) at room temperature. After 1 hour, the reaction mixture was diluted with EtOAc (100 mL), and washed with water (3 x 15 mL). The organic layer was dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure to afford the title compound (220 mg, 0.724 mmol, 93.6 % yield), which was used directly in the next step without further purification. LC-MS calculated for $C_{10}H_{14}BrN_2O_2S$ $(M+H)^+$: m/z = 305.0/307.0; found 305.0/307.0.

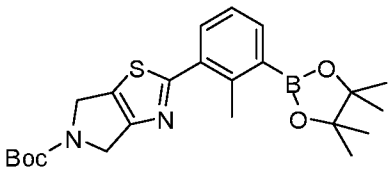
Step 2: tert-butyl 2-(3-chloro-2-methylphenyl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate



A mixture of (3-chloro-2-methylphenyl)boronic acid (*Combi Blocks cat#BB-2035:* 335 mg, 1.966 mmol), tert-butyl 2-bromo-4,6-dihydro-5H-pyrrolo[3,4-d]thiazole-5-carboxylate (600.0 mg, 1.966 mmol), tetrakis(triphenylphosphine)palladium(0) (114 mg, 0.098 mmol) and sodium carbonate (521 mg, 4.91 mmol) in dioxane (8 mL) and water (2 mL) was degassed and sealed. It was stirred at 100°C overnight. After the reaction mixture

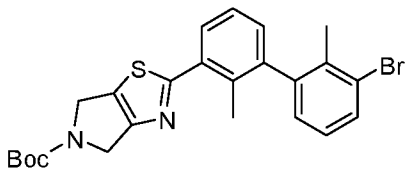
was cooled to room temperature, it was diluted with EtOAc (100 mL), and washed with water. The organic layer was dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The residue was purified by chromatography on silica gel, eluting with 0-40% EtOAc/hexanes, to give the desired product (590 mg). LC-MS calculated for $C_{17}H_{20}ClN_2O_2S$ $(M+H)^+$: m/z = 351.1; found 351.1.

Step 3: tert-butyl 2-(2-methyl-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate



A mixture of tert-butyl 2-(3-chloro-2-methylphenyl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazole-5-carboxylate (268 mg, 0.764 mmol), 4,4,4',4',5,5,5',5'-octamethyl-2,2'-bi(1,3,2-dioxaborolane) (291 mg, 1.146 mmol), tris(dibenzylideneacetone)dipalladium(0) (56.0 mg, 0.061 mmol), 2-dicyclohexylphosphino-2',4',6'-tri-iso-propyl-1,1'-biphenyl (58.3 mg, 0.122 mmol) and potassium acetate (150 mg, 1.528 mmol) in 1,4-dioxane (8 mL) was degassed with N_2 and was stirred at 100 °C for 2.5 h. After cooling to room temperature, the reaction mixture was diluted with DCM and filtered. The filtrate was concentrated under reduced pressure and the crude product was purified by chromatography on silica gel, eluting with 0-30% EtOAc/hexanes, to give the desired product (269 mg). LC-MS calculated for $C_{23}H_{32}BN_2O_4S$ $(M+H)^+$: m/z = 443.2; found 443.2.

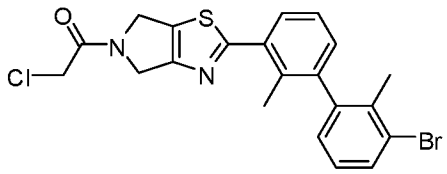
Step 4: tert-butyl 2-(3'-bromo-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate



A mixture of 1,3-dibromo-2-methylbenzene (*Combi Blocks cat#OT-1437:* 339 mg, 1.356 mmol), tert-butyl 2-(2-methyl-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazole-5-carboxylate (200.0 mg, 0.452 mmol), sodium carbonate (96 mg, 0.904 mmol) and tetrakis(triphenylphosphine)palladium(0) (52.2 mg, 0.045 mmol) in dioxane (3.00 mL)/ water (1.0 mL) was heated at 90 °C overnight. The

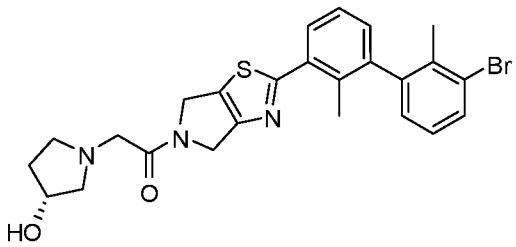
reaction was then cooled to room temperature, diluted with saturated aqueous NH_4Cl, and extracted with EtOAc (3 x 30 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered, and the filtrate was concentrated under reduced pressure. The crude residue was purified by chromatography on silica gel, eluting with 0-40% EtOAc/hexanes, to give the desired product (210 mg). LC-MS calculated for $C_{24}H_{26}BrN_2O_2S$ $(M+H)^+$: m/z = 485.1/487.1; found 485.0/487.0.

Step 5: 1-(2-(3'-bromo-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-chloroethanone



Tert-butyl 2-(3'-bromo-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate (210 mg, 0.433 mmol) was dissolved in TFA/DCM (1 mL/1 mL) at room temperature. After 1 h, the volatiles were removed under reduced pressure and the residue was dissolved in dichloromethane (3.0 mL). Hunig's base (0.237 mL, 1.356 mmol) and 2-chloroacetyl chloride (56.2 mg, 0.497 mmol) were added sequentially at room temperature and the resulting mixture was stirred for 30 min. The reaction was then quenched with saturated aqueous NH_4Cl, and extracted with EtOAc (3 x 30 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The crude residue was purified by chromatography on silica gel, eluting with 0-40% ethyl acetate/hexanes, to give the desired product (181 mg). LC-MS calculated for $C_{21}H_{19}BrClN_2OS$ $(M+H)^+$: m/z = 461.0/463.0; found 460.9/462.9.

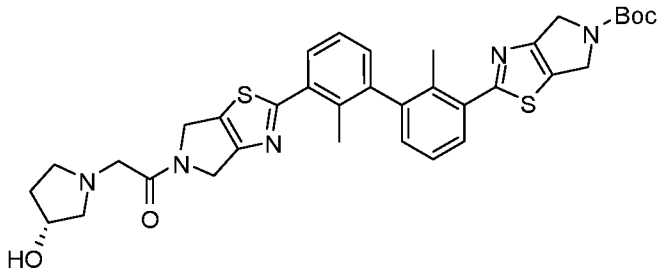
Step 6: (R)-1-(2-(3'-bromo-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(3-hydroxypyrrolidin-1-yl)ethanone



To a stirred solution of 1-(2-(3'-bromo-2,2'-dimethyl-[1,1'-biphenyl]-3-yl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazol-5-yl)-2-chloroethan-1-one (50.0 mg, 0.108 mmol) and (R)-

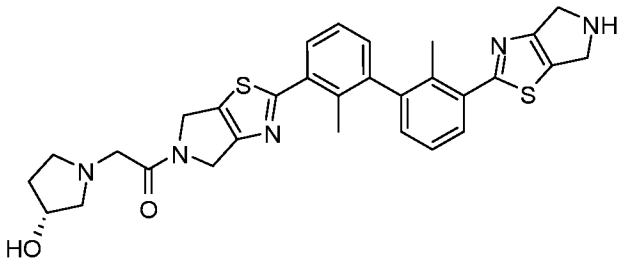
pyrrolidin-3-ol (11.32 mg, 0.130 mmol) in acetonitrile (2.0 ml), Hunig's base (0.038 ml, 0.217 mmol) was added at room temperature. The resulting mixture was stirred at 60 °C for 2 hours. The volatiles were removed under reduced pressure and the residue was purified by chromatography on silica gel, eluting with 0-15% MeOH/DCM, to give the desired product (45 mg). LC-MS calculated for $C_{25}H_{27}BrN_3O_2S$ $(M+H)^+$: m/z = 512.1/514.1; found 512.1/514.1.

Step 7: (R)-tert-butyl 2-(3'-(5-(2-(3-hydroxypyrrolidin-1-yl)acetyl)-5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate



A mixture of (R)-1-(2-(3'-bromo-2,2'-dimethyl-[1,1'-biphenyl]-3-yl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazol-5-yl)-2-(3-hydroxypyrrolidin-1-yl)ethan-1-one (120 mg, 0.234 mmol), Bis(pinacolato)diboron (71.4 mg, 0.281 mmol), dichloro[1,1'-bis(diphenylphosphino)ferrocene]palladium (II) dichloromethane adduct (19.12 mg, 0.023 mmol) and potassium acetate (46.0 mg, 0.468 mmol) in dioxane (5 mL) was charged with nitrogen and stirred at 110 °C for 2 h. After the reaction mixture was cooled to room temperature, tert-butyl 2-bromo-4,6-dihydro-5H-pyrrolo[3,4-d]thiazole-5-carboxylate (71.5 mg, 0.234 mmol), another portion of dichloro[1,1'-bis(diphenylphosphino)ferrocene]palladium (II) dichloromethane adduct (19.12 mg, 0.023 mmol), sodium carbonate (49.6 mg, 0.468 mmol), and water (1 mL) were added sequentially. The resulting mixture was heated at 110 °C for 3 h. After the mixture was cooled to room temperature, the reaction quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3 x 10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The residue was purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product (52 mg) as its TFA salt. LC-MS calculated for $C_{35}H_{40}N_5O_4S_2$ $(M+H)^+$: m/z = 658.3; found 658.2.

Step 8: (R)-1-(2-(3'-(5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(3-hydroxypyrrolidin-1-yl)ethanone

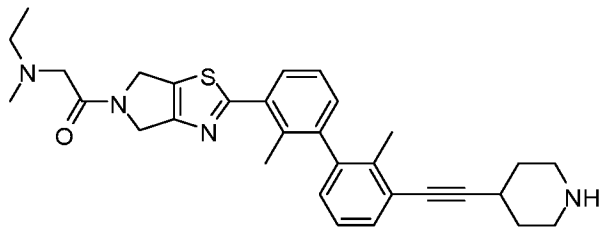


(R)-tert-butyl 2-(3'-(5-(2-(3-hydroxypyrrolidin-1-yl)acetyl)-5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazole-5(6H)-carboxylate (52 mg, 0.079 mmol) was dissolved in TFA (1 mL) / DCM (1 mL) and stirred at room temperature. After 1 h, the volatiles were removed under reduced pressure to afford the crude product, which was used directly in the next step without further purification. LC-MS calculated for $C_{30}H_{32}N_5O_2S_2$ $(M+H)^+$: m/z = 558.2; found 558.2.

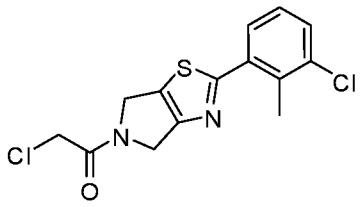
Step 9: (R)-2-(dimethylamino)-1-(2-(3'-(5-(2-(3-hydroxypyrrolidin-1-yl)acetyl)-5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)ethanone

To a stirred solution of (R)-1-(2-(3'-(5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethyl-[1,1'-biphenyl]-3-yl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazol-5-yl)-2-(3-hydroxypyrrolidin-1-yl)ethan-1-one (10.0 mg, 0.018 mmol) and dimethylglycine (3.70 mg, 0.036 mmol) in DMF (1.0 ml) , N,N,N',N'-tetramethyl-O-(7-azabenzotriazol-1-yl)uronium hexafluorophosphate (6.82 mg, 0.018 mmol), and N,N-diisopropylethylamine (3.75 µl, 0.022 mmol) were added sequentially at room temperature. After 1 hour, the mixture was diluted with acetonitrile and purified by prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{34}H_{39}N_6O_3S_2$ $(M+H)^+$: m/z = 643.3; found 643.2.

Example 36: 1-(2-(2,2'-dimethyl-3'-(piperidin-4-ylethynyl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone

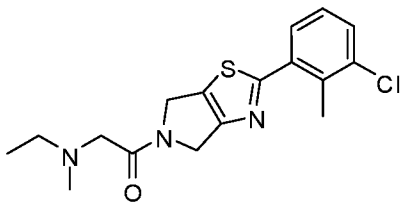


Step 1: 2-chloro-1-(2-(3-chloro-2-methylphenyl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)ethanone



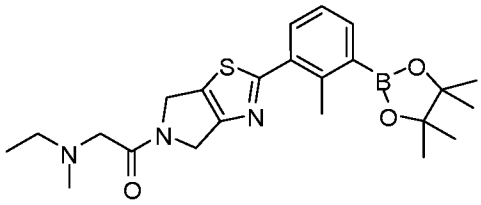
To a stirred solution of tert-butyl 2-(3-chloro-2-methylphenyl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazole-5-carboxylate (*Example 35, step 2:* 408 mg, 1.163 mmol) in DCM (2 mL) at room temperature, TFA (2 mL) was added. After 1 h, the volatiles were removed and the residue was dissolved in DCM (3 mL). Hunig's base (0.406 mL, 2.326 mmol) and 2-chloroacetyl chloride (0.102 mL, 1.279 mmol) were then added sequentially at room temperature. After and additional hour, the reaction mixture was quenched with saturated aq. $NaHCO_3$, extracted with DCM (3 x 50 mL). The organic layers were combined, dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The residue was purified by chromatography on silica gel, eluting with 0-30% EtOAc/hexanes, to give the desired product (362 mg). LC-MS calculated for $C_{14}H_{13}Cl_2N_2OS$ $(M+H)^+$: m/z = 327.0; found 327.0.

Step 2: 1-(2-(3-chloro-2-methylphenyl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone



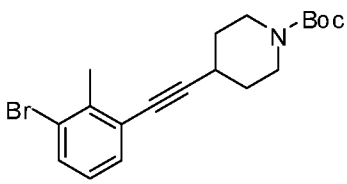
To a stirred solution of 2-chloro-1-(2-(3-chloro-2-methylphenyl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazol-5-yl)ethan-1-one (200.0 mg, 0.611 mmol) in acetonitrile (3.0 ml), N-methylethanamine (36.1 mg, 0.611 mmol) and Hunig's base (107 µl, 0.611 mmol) were added at room temperature. The resulting mixture was heated at 60°C. After 2 h, the reaction mixture was quenched with saturated aq. $NaHCO_3$, and extracted with DCM (3 x 50 mL). The organic layers were combined, dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The residue was purified by chromatography on silica gel, eluting with 0-5% MeOH/DCM, to give the desired product (203 mg). LC-MS calculated for $C_{17}H_{21}ClN_3OS$ $(M+H)^+$: m/z = 350.1; found 350.1.

Step 3: 2-(ethyl(methyl)amino)-1-(2-(2-methyl-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)ethanone



A mixture of 1-(2-(3-chloro-2-methylphenyl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone (192 mg, 0.550 mmol), 4,4,4',4',5,5,5',5'-octamethyl-2,2'-bi(1,3,2-dioxaborolane) (209 mg, 0.824 mmol), tris(dibenzylideneacetone)dipalladium(0) (40.3 mg, 0.044 mmol), 2-dicyclohexylphosphino-2',4',6'-tri-iso-propyl-1,1'-biphenyl (41.9 mg, 0.088 mmol) and potassium acetate (108 mg, 1.099 mmol) in 1,4-dioxane (5.0 ml) was degassed with N_2 and was stirred at 100 °C for 3 h. The reaction mixture was quenched with saturated aq. NH_4Cl, and extracted with DCM (3 x 50 mL). The organic layers were combined, dried over Na_2SO_4, filtered and the filtrate was concentrated under reduced pressure. The residue was purified by chromatography on silica gel, eluting with 0-10% MeOH/DCM, to give the desired product (168 mg). LC-MS calculated for $C_{23}H_{33}BN_3O_3S$ $(M+H)^+$: m/z = 442.2; found 442.2

Step 4: tert-butyl 4-((3-bromo-2-methylphenyl)ethynyl)piperidine-1-carboxylate

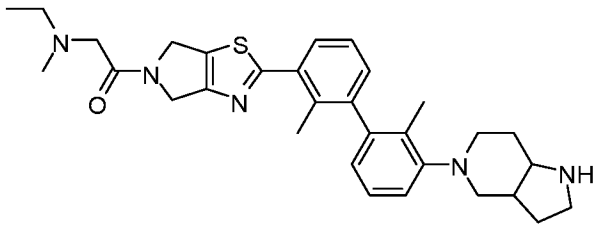


A mixture of 1,3-dibromo-2-methylbenzene (*Combi-Blocks cat#OT-1437:* 143 mg, 0.573 mmol), tert-butyl 4-ethynylpiperidine-1-carboxylate (*Ark Pharm catalog # AK-34528*: 60 mg, 0.287 mmol), copper(I) iodide (4.37 mg, 0.023 mmol), dichlorobis(triphenylphosphine)-palladium(II) (26.8 mg, 0.038 mmol), and triethylamine (0.080 ml, 0.573 mmol) in 1,4-Dioxane (3.0 ml) was flushed with N_2. The resulting slurry was stirred at 90 °C for 3 h. The reaction was then quenched with water, extracted with EtOAc (3 x 15 mL). The organic layers were combined, dried over Na_2SO_4, filtered, and the filtrate was concentrated under reduced pressure. The crude residue was purified by chromatography on silica gel, eluting with 0-35% ethyl acetate/hexanes, to give the desired product. LC-MS calculated for $C_{15}H_{17}BrNO_2$ $(M+H-t\text{Bu})^+$: m/z = 322.0; found 322.0

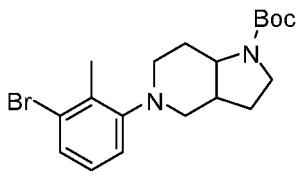
Step 5: 1-(2-(2,2'-dimethyl-3'-(piperidin-4-ylethynyl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone

A mixture of *tert*-butyl 4-((3-bromo-2-methylphenyl)ethynyl)piperidine-1-carboxylate (8.57 mg, 0.023 mmol), 2-(ethyl(methyl)amino)-1-(2-(2-methyl-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)phenyl)-4,6-dihydro-5H-pyrrolo[3,4-d]thiazol-5-yl)ethan-1-one (10.0 mg, 0.023 mmol), sodium carbonate (4.80 mg, 0.045 mmol) and bis(di-cyclohexylphosphino)ferrocene]dichloropalladium(II) (1.717 mg, 2.266 μmol) in *t*-BuOH (0.800 mL)/water (0.8 mL) was heated at 90 °C for 2 h. The reaction was then quenched with water, and extracted with EtOAc (3 x 10 mL). The organic layers were combined, dried over Na_2SO_4, filtered, and the filtrate was concentrated under reduced pressure. The residue was purified by chromatography on silica gel, eluting with 0-10% MeOH/DCM, to give the coupling product. The purified coupling product was dissolved in TFA (0.5 mL)/ DCM (0.5 mL) and stirred at room temperature for 1 hour after which time the volatiles were removed and the crude residue was purified on prep LCMS (pH 2, acetonitrile/water+TFA) to give the desired product as its TFA salt. LC-MS calculated for $C_{31}H_{37}N_4OS$ $(M+H)^+$: m/z = 513.3; found 513.3.

Example 37: 1-(2-(2,2'-dimethyl-3'-(tetrahydro-1H-pyrrolo[3,2-c]pyridin-5(6H,7H,7aH)-yl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone



Step 1: tert-butyl 5-(3-bromo-2-methylphenyl)octahydro-1H-pyrrolo[3,2-c]pyridine-1-carboxylate



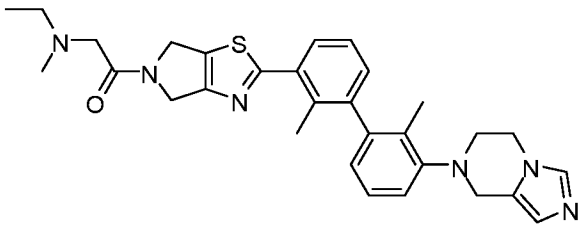
A mixture of *tert*-butyl octahydro-1H-pyrrolo[3,2-c]pyridine-1-carboxylate (*Combi-Blocks catalog # ST-7254:* 60 mg, 0.265 mmol), 1,3-dibromo-2-methylbenzene (*Combi-*

Blocks cat# OT-1437: 199 mg, 0.795 mmol), palladium(II) acetate (5.95 mg, 0.027 mmol), (R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl (16.51 mg, 0.027 mmol), and cesium carbonate (173 mg, 0.530 mmol) in 1,4-Dioxane (5.0 ml) was flushed with N_2. The resulting slurry was stirred at 90 °C overnight. After being cooled to room temperature, the reaction mixture was quenched with saturated aqueous $NaHCO_3$, and extracted with ethyl acetate (3x 10 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography on a silica gel, eluting with ethyl acetate in hexanes (0-50%) to afford the desired product. LC-MS calculated for $C_{19}H_{28}BrN_2O_2$ $(M+H)^+$: m/z = 395.1; found 395.1.

Step 2: 1-(2-(2,2'-dimethyl-3'-(tetrahydro-1H-pyrrolo[3,2-c]pyridin-5(6H,7H,7aH)-yl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone

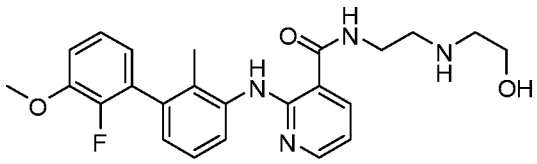
This compound was prepared using similar procedures as described for *Example 36, Step 5* with tert-butyl 5-(3-bromo-2-methylphenyl)octahydro-1H-pyrrolo[3,2-c]pyridine-1-carboxylate replacing tert-butyl 4-((3-bromo-2-methylphenyl)ethynyl)piperidine-1-carboxylate. LC-MS calculated for $C_{31}H_{40}N_5OS$ $(M+H)^+$: m/z = 530.3 ; found 530.4.

Example 38: 1-(2-(3'-(5,6-dihydroimidazo[1,5-a]pyrazin-7(8H)-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone

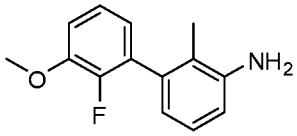


This compound was prepared using similar procedures as described for *Example 37* with 5,6,7,8-tetrahydroimidazo[1,5-a]pyrazine (*Combi-Blocks, catalog # QB-0196*) replacing *tert*-butyl octahydro-1H-pyrrolo[3,2-c]pyridine-1-carboxylate in *Step 1* and without the treatment with TFA/DCM in *Step 2.* LC-MS calculated for $C_{30}H_{35}N_6OS$ $(M+H)^+$: m/z = 527.3 ; found 527.2

Example 39: 2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)-*N*-(2-(2-hydroxyethylamino)ethyl)nicotinamide

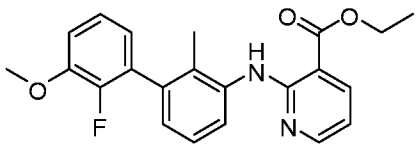


Step 1: 2'-fluoro-3'-methoxy-2-methylbiphenyl-3-amine



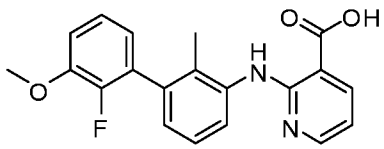
To a vial was added 3-bromo-2-methylaniline (Aldrich, cat#530018: 0.331 ml, 2.69 mmol), (2-fluoro-3-methoxyphenyl)boronic acid (Aldrich, cat#594253: 0.502 g, 2.96 mmol), sodium carbonate (0.570 g, 5.37 mmol), 1,1'-bis(di-cyclohexylphosphino)ferrocene palladium dichloride (0.041 g, 0.054 mmol), 1,4-dioxane (12.5 mL) and water (4.5 mL). The mixture was degassed, sealed, and heated to 110 °C whilst stirring for 2 h. After cooling, the layers were separated and the aqueous layer was extracted with ethyl acetate (3 X 10 mL). The combined organic layers were washed with brine, dried over magnesium sulfate, filtered, and concentrated in vacuo. The crude residue was purified by silica gel chromatography (0 → 20% EtOAc/hexanes). LC-MS calculated for $C_{14}H_{15}FNO$ $(M+H)^+$: m/z = 232.1; found 232.1.

Step 2: ethyl 2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)nicotinate



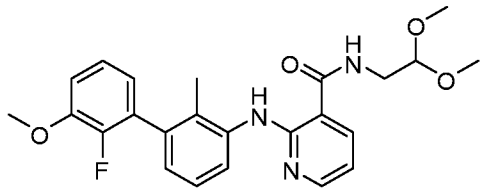
To a vial was added ethyl 2-chloronicotinate (Alfa Aesar, cat#B20359: 0.193 g, 1.038 mmol), 2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-amine (0.2 g, 0.865 mmol), 1,4-dioxane (7.21 ml), cesium carbonate (0.564 g, 1.730 mmol), 9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene (0.060 g, 0.104 mmol), and tris(dibenzylideneacetone)dipalladium(0) (0.079 g, 0.086 mmol). The mixture was degassed and heated to 100 °C for 2 h. After cooling, the mixture was diluted with EtOAc and filtered through Celite®. The filtrate was concentrated under reduced pressure and purified by silica gel chromatography (50% EtOAc/hexanes) to provide the desired compound as an orange oil. LC-MS calculated for $C_{22}H_{22}FN_2O_3$ $(M+H)^+$: m/z = 381.2; found 381.3.

Step 3: 2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)nicotinic acid



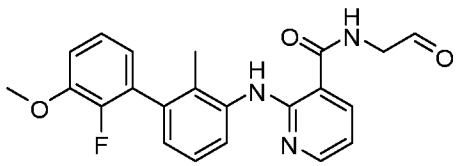
To a vial was added ethyl 2-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)nicotinate (0.329 g, 0.865 mmol), MeOH (2.162 ml), THF (2.162 ml), and 2 M LiOH in water (2.162 ml, 4.32 mmol). The mixture was stirred at rt for 1 h. The mixture was acidified using 2 M citric acid, and the aqueous layer was extracted with 3:1 $CHCl_3$/IPA. The combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo. The crude acid was used directly in the next step. LC-MS calculated for $C_{20}H_{18}FN_2O_3$ $(M+H)^+$: m/z = 353.1; found 353.2.

Step 4: N-(2,2-dimethoxyethyl)-2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)nicotinamide



To a solution of 2-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)nicotinic acid (0.305 g, 0.866 mmol) in dichloromethane (4.33 mL) was added aminoacetaldehyde dimethyl acetal (Alfa Aesar, cat#A15498: 0.283 mL, 2.60 mmol), DIPEA (0.756 mL, 4.33 mmol), and HATU (0.987 g, 2.60 mmol) at rt. The resulting mixture was stirred at rt for 1 h. The mixture was diluted with water and DCM, and the layers were separated. The aqueous layer was further extracted with DCM, and the combined organic layers were dried over $MgSO_4$, filtered, and concentrated in vacuo to provide the desired product as a red oil which was used directly in the next step. LC-MS calculated for $C_{24}H_{27}FN_3O_4$ $(M+H)^+$: m/z = 440.2; found 440.2.

Step 5: 2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)-N-(2-oxoethyl)nicotinamide



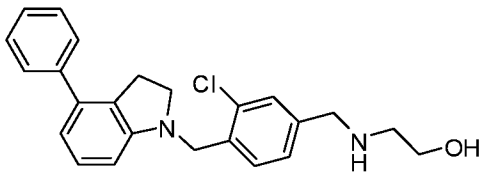
To a solution of *N*-(2,2-dimethoxyethyl)-2-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)nicotinamide (0.392 g, 0.892 mmol) in DCM (8.92 ml) was added TFA

(3.44 ml, 44.6 mmol) dropwise at rt. The mixture was stirred for 1 h, and was subsequently concentrated under reduced pressure. The resulting residue was re-dissolved in DCM, and washed with aqueous saturated $NaHCO_3$. The layers were separated and the organic phase was dried over $MgSO_4$, filtered, and concentrated in vacuo. The resulting crude oil was used directly in the next step without further purification. LC-MS calculated for $C_{22}H_{21}FN_3O_3$ $(M+H)^+$: m/z = 394.2; found 394.2.

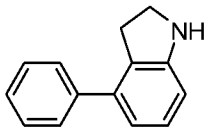
Step 6: 2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)-N-(2-(2-hydroxyethylamino)ethyl)nicotinamide

To a vial was added 2-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)-*N*-(2-oxoethyl)nicotinamide (0.020 g, 0.051 mmol), ethanolamine (Aldrich, cat#398136: 3.07 µL, 0.051 mmol), a stir bar, and DCE (0.508 mL). The mixture was stirred for 5 min, then sodium cyanoborohydride (9.58 mg, 0.153 mmol) and acetic acid (8.73 µL, 0.153 mmol) were added, and the mixture was stirred for 2 h at rt. The mixture was diluted with methanol and purified by prep HPLC (pH = 2, acetonitrile/water+TFA) to afford the desired product as the TFA salt. LC-MS calculated for $C_{24}H_{28}FN_4O_3$ $(M+H)^+$: m/z = 439.2; found 439.2.

Example 40: 2-({3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzyl}amino)ethanol

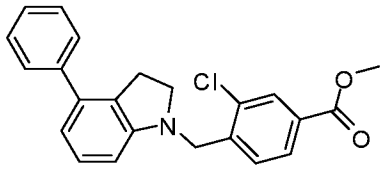


Step 1: 4-phenylindoline



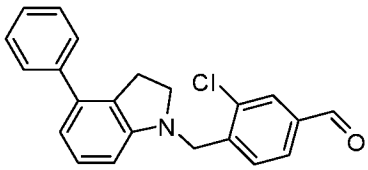
A mixture of 4-bromoindoline (*AstaTech, cat#BL008582*: 253 mg, 1.28 mmol), phenylboronic acid (187 mg, 1.53 mmol), dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene] palladium(II) (50 mg, 0.06 mmol) and potassium phosphate (540 mg, 2.6 mmol) in water (838 µl) and dioxane (4192 µl) was purged with N_2 and then stirred at 90 °C for 4 h. After cooling to room temperature, the mixture was concentrated and the corresponding residue was purified by column chromatography. LC-MS calculated for $C_{14}H_{14}N$ $(M+H)^+$: m/z = 196.1; found 196.1.

Step 2: methyl 3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzoate



To a solution of methyl 3-chloro-4-formylbenzoate (*AstaTech, cat#CL9164*: 123 mg, 0.619 mmol) and 4-phenylindoline (145 mg, 0.742 mmol) in DCM (5 ml) was added sodium triacetoxyborohydride (459 mg, 2.16 mmol) and acetic acid (0.62 mmol). The reaction was stirred at r.t. for 2 h. The mixture was then diluted with aqueous ammonium hydroxide, and was extracted with DCM three times. The combined DCM solutions were washed with water, brine and dried over $MgSO_4$. The DCM solution was then filtered and concentrated. The residue was purified by flash chromatography eluting with 0-15% EtOAc in hexanes. LC-MS calculated for $C_{23}H_{21}ClNO_2$ $(M+H)^+$: m/z = 378.1; found 378.1.

Step 3: 3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzaldehyde



To a solution of methyl 3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl] benzoate (150 mg, 0.40 mmol) in THF (2 ml) was added diisobutylaluminum hydride (1.0 M in THF, 0.95 mmol) slowly at 0 °C. The mixture was slowly warmed up to r.t. and stirred for 1 h. The reaction was then quenched by EtOAc and Rochelle's salt solution. The mixture was vigorously stirred for 30 min. The organic layer was separated, concentrated and used directly for oxidation. LC-MS calculated for $C_{22}H_{21}ClNO$ $(M+H)^+$: m/z = 350.1; found 350.1.

To the solution of above residue in DCM (2 ml) was added sodium bicarbonate (100 mg, 1.00 mmol) and Dess-Martin periodinane (220 mg, 0.52 mmol). The mixture was stirred at r.t. for 30 min. The reaction was quenched by aq. $NaHCO_3$ solution and aq. $Na_2S_2O_3$ solution. The mixture was extracted with DCM three times. The organic phase was combined, concentrated and purified by flash chromatography. LC-MS calculated for $C_{22}H_{19}ClNO$ $(M+H)^+$: m/z = 348.1; found 348.1.

Step 4: 3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzaldehyde

To a solution of 3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzaldehyde (30 mg, 0.09 mmol) and ethanolamine (0.11 mmol) in DCM (0.5 ml) was added sodium triacetoxyborohydride (27 mg, 0.13 mmol). After addition, the reaction was stirred at r.t. for 45 min. The reaction was then diluted in MeOH and purified by prep-HPLC (pH =10, acetonitrile/water+NH_4OH) to give the desired product. LC-MS calculated for $C_{24}H_{26}ClN_2O$ $(M+H)^+$: m/z = 393.2; found 393.1.

Example A. PD-1/PD-L1 Homogeneous Time-Resolved Fluorescence (HTRF) binding assay

The assays were conducted in a standard black 384-well polystyrene plate with a final volume of 20 μL. Inhibitors were first serially diluted in DMSO and then added to the plate wells before the addition of other reaction components. The final concentration of DMSO in the assay was 1%. The assays were carried out at 25° C in the PBS buffer (pH 7.4) with 0.05% Tween-20 and 0.1% BSA. Recombinant human PD-L1 protein (19-238) with a His-tag at the C-terminus was purchased from AcroBiosystems (PD1-H5229). Recombinant human PD-1 protein (25-167) with Fc tag at the C-terminus was also purchased from AcroBiosystems (PD1-H5257). PD-L1 and PD-1 proteins were diluted in the assay buffer and 10 μL was added to the plate well. Plates were centrifuged and proteins were preincubated with inhibitors for 40 minutes. The incubation was followed by the addition of 10 μL of HTRF detection buffer supplemented with Europium cryptate-labeled anti-human IgG (PerkinElmer-AD0212) specific for Fc and anti-His antibody conjugated to SureLight®-Allophycocyanin (APC, PerkinElmer-AD0059H). After centrifugation, the plate was incubated at 25° C for 60 min. before reading on a PHERAstar FS plate reader (665nm/620nm ratio). Final concentrations in the assay were - 3 nM PD1, 10 nM PD-L1, 1 nM europium anti-human IgG and 20 nM anti-His-Allophycocyanin.IC_{50} determination was performed by fitting the curve of percent control activity versus the log of the inhibitor concentration using the GraphPad Prism 5.0 software.

Compounds of the present disclosure, as exemplified in the Examples, showed IC_{50} values in the following ranges: + = $IC_{50} \leq 10$ nM; ++ = 10 nM < $IC_{50} \leq 100$ nM; +++ = 100 nM < $IC_{50} \leq 1000$ nM; ++++ = 1000 nM < IC50 ≤ 2000 nM

Data obtained for the Example compounds using the PD-1/PD-L1 homogenous time-resolved fluorescence (HTRF) binding assay described in Example A is provided in Table 1A.

Table 1A

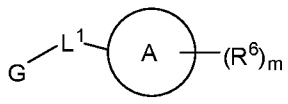
Example	PD-1/PD-L1 HTRF IC_{50} (nM)
1	++
2	++
3	+
4	++
5	++
6	++
7	++
8	++
9	++
10	+++
11	+++
12	+++
13	++
14	+++
15	+++
16	+++
17	+++
18	+++
19	+++
20	+++
21	+++
22	+++
23	++++
24	+++
25	+++
26	+++
27	+++
28	++++
29	++++
30	+++
31	+++
32	+++
33	++++
34	+++
35	+
36	+
37	+++
38	++
39	+++
40	+++

Various modifications of the invention, in addition to those described herein, will be apparent to those skilled in the art from the foregoing description. Such modifications are

also intended to fall within the scope of the appended claims. Each reference, including without limitation all patent, patent applications, and publications, cited in the present application is incorporated herein by reference in its entirety.

What is claimed is:

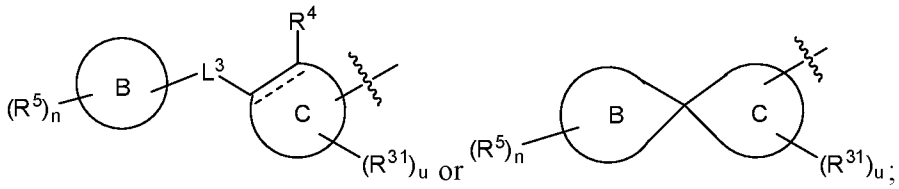
1. A compound of Formula (I'):



(I')

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

G has Formula (I'e) or (I'b)



(I'e) (I'b)

when G is of Formula (I'a), the atoms on ring C, to which the substituent R^4 and ring B are attached can be either carbon or nitrogen; and ---- is a single bond or a double bond;

when G is of Formula (I'b), ring B and ring C are joined together through a quaternary ring carbon atom to form a spiro structure and ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=S)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=S)(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=NR^{13})NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=NR^{13})(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=NOR^{13})NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=NOR^{13})(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=NCN)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=NCN)(CR^{14}R^{15})_t$ -, O, $-(CR^{14}R^{15})_p$-, $-(CR^{14}R^{15})_p$-O-, -O$(CR^{14}R^{15})_p$-, $-(CR^{14}R^{15})_p$-O-$(CR^{14}R^{15})_p$-, S, $-(CR^{14}R^{15})_p$-S-, -S$(CR^{14}R^{15})_p$-, $-(CR^{14}R^{15})_p$-S-$(CR^{14}R^{15})_p$-, $-NR^{13}$-, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t$ -, -NH-, $-(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t$-, $-CR^{13}=CR^{13}$-, —C≡C—, $-SO_2$-, $-(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t$ -, $-NR^{13}C(O)O$-, $-(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t$ -, -O(CO)NR^{13}-, $-NR^{13}C(O)NR^{13}$- or $-(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

L^3 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=S)NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=S)(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=NR^{13})NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=NR^{13})(CR^{14}R^{15})_t$ -, $-(CR^{14}R^{15})_tC(=NOR^{13})NR^{13}(CR^{14}R^{15})_t$-, $-(CR^{14}R^{15})_tNR^{13}C(=NOR^{13})(CR^{14}R^{15})_t$ -, –

$(CR^{14}R^{15})_tC(=NCN)NR^{13}(CR^{14}R^{15})_t$-, -$(CR^{14}R^{15})_tNR^{13}C(=NCN)(CR^{14}R^{15})_t$ -, O, -$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-, -O$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-O-$(CR^{14}R^{15})_p$-, S, -$(CR^{14}R^{15})_p$-S-, -S$(CR^{14}R^{15})_p$-, -$(CR^{14}R^{15})_p$-S-$(CR^{14}R^{15})_p$-, -NR^{13}-, -$(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t$ -, -NH-, -$(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t$-, -$CR^{13}$=$CR^{13}$-, —C≡C—, -$SO_2$-, -$(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t$ -, -$(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t$ -, -$NR^{13}C(O)O$-, -$(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t$ -, -$O(CO)NR^{13}$-, –$NR^{13}C(O)NR^{13}$- or -$(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring C is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, -NHC_{1-4} alkyl and –N(C_{1-4} alkyl)$_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, -NHC_{1-4} alkyl, -N(C_{1-4} alkyl)$_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^4 is H, halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, -NHR^8, -NR^8R^8, C(O)R^8,

$C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5, R^6 and R^{31} are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, $C(O)NR^aS(O)_2R^a$, $NR^aC(=NR^a)R^a$, $S(O)_2NR^aC(O)R^a$, $-P(O)R^aR^a$, $-P(O)(OR^a)(OR^a)$, $-B(OH)_2$, $-B(OR^a)_2$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5, R^6 and R^{31} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered

heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^{31} substituents on ring C, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{31} substituents on the same ring carbon atom of ring C, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, B, P, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-

, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$, $C(O)NR^cS(O)_2R^c$, $NR^cC(=NR^c)R^c$, $S(O)_2NR^cC(O)R^c$, $-P(O)R^cR^c$, $-P(O)(OR^c)(OR^c)$, $-B(OH)_2$, $-B(OR^c)_2$, and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$,

$NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$, $NR^gS(O)_2NR^gR^g$, $C(O)NR^gS(O)_2R^g$, $NR^gC(=NR^g)R^g$, $S(O)_2NR^gC(O)R^g$, $-P(O)R^gR^g$, $-P(O)(OR^g)(OR^g)$, $-B(OH)_2$, $-B(OR^g)_2$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 independently selected R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, $C(O)NR^oS(O)_2R^o$, $NR^oC(=NR^o)R^o$, $S(O)_2NR^oC(O)R^o$, $-P(O)R^oR^o$, $-P(O)(OR^o)(OR^o)$, $-B(OH)_2$, $-B(OR^o)_2$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, $C(O)NR^eS(O)_2R^e$, $NR^eC(=NR^e)R^e$, $S(O)_2NR^eC(O)R^e$, $-P(O)R^eR^e$, $-P(O)(OR^e)(OR^e)$, $-B(OH)_2$, $-B(OR^e)_2$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered

heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 independently selected R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$, $C(O)NR^rS(O)_2R^r$, $NR^rC(=NR^r)R^r$, $S(O)_2NR^rC(O)R^r$, $-P(O)R^rR^r$, $-P(O)(OR^r)(OR^r)$, $-B(OH)_2$, $-B(OR^r)_2$, and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i,

$NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, $C(O)NR^iS(O)_2R^i$, $NR^iC(=NR^i)R^i$, $S(O)_2NR^iC(O)R^i$, $P(O)R^iR^i$, $-P(O)(OR^i)(OR^i)$, $-B(OH)_2$, $-B(OR^i)_2$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 independently selected R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$, $NR^kS(O)_2NR^kR^k$, $C(O)NR^kS(O)_2R^k$, $NR^kC(=NR^k)R^k$, $S(O)_2NR^kC(O)R^k$, $P(O)R^kR^k$, $-P(O)(OR^k)(OR^k)$, $-B(OH)_2$, $-B(OR^k)_2$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4} haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted

with 1, 2, or 3 independently selected R^h substituents, or 1, 2, or 3 independently selected R^q substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents, or 1, 2, or 3 independently selected R^q substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4} alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl, 5- or 6-membered heteroaryl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

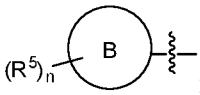
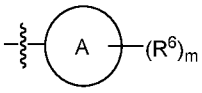
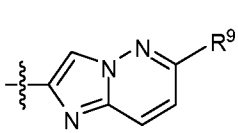
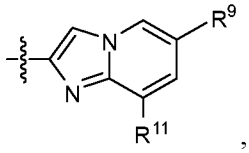
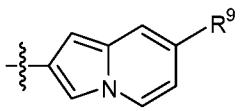
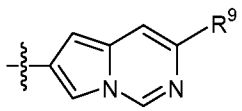
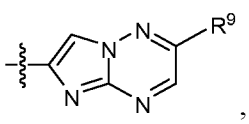
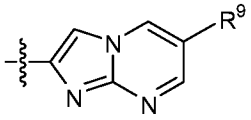
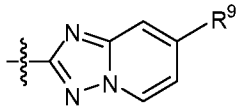
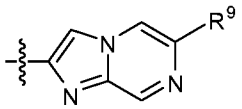
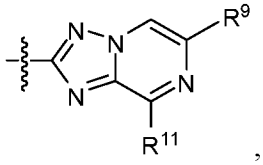
the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

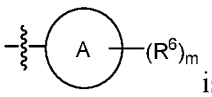
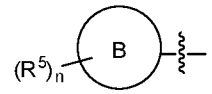
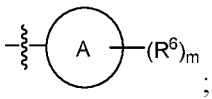
each subscript p is independently an integer of 1, 2, 3 or 4;

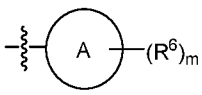
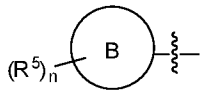
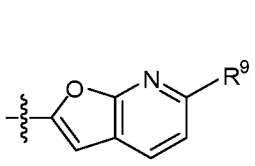
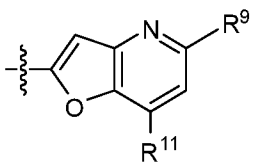
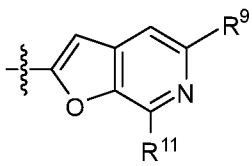
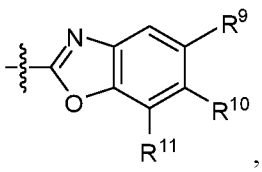
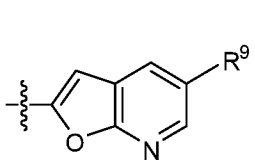
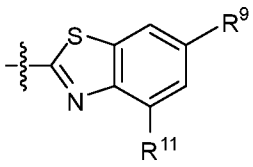
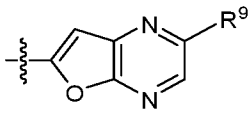
each subscript t is independently an integer of 0, 1, 2, 3 or 4;

the subscript u is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

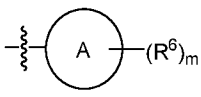
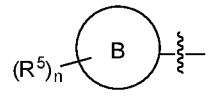
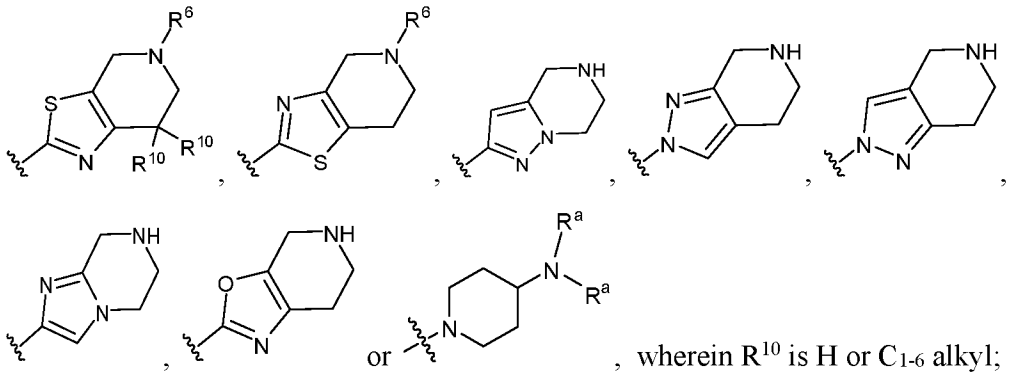
with the proviso:

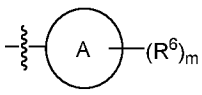
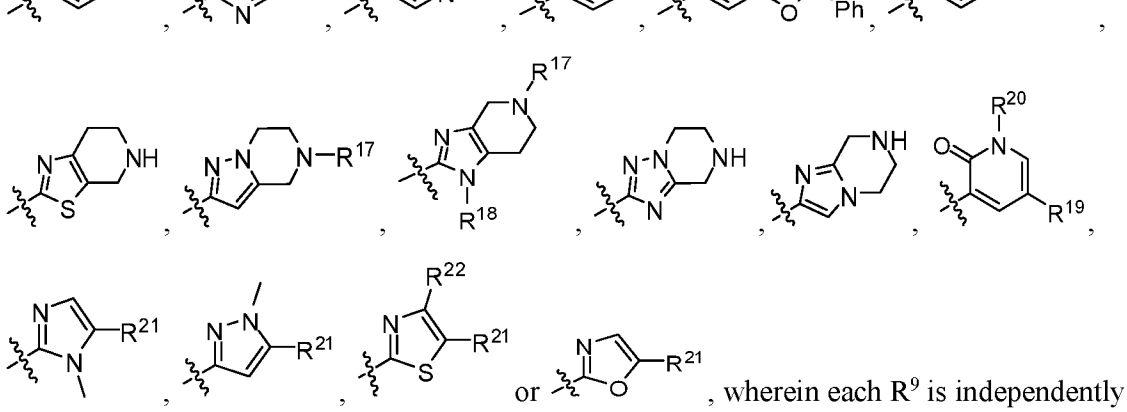
(i) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not , , , , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl,  is not any of the moieties set forth in proviso (i) above for ;

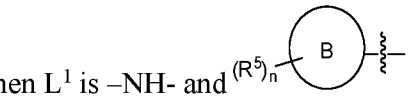
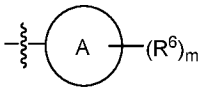
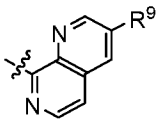
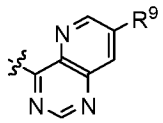
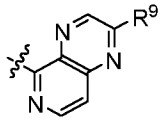
(iii) when L^1 is a bond, then  or  is not , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-

pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  or  is not  wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not  wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is

independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

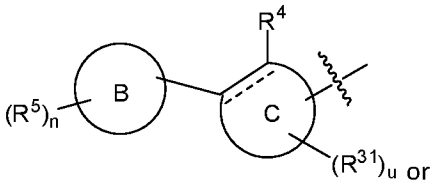
(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

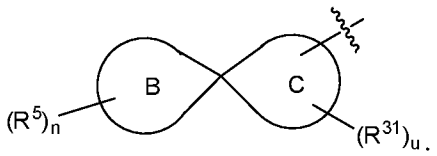
(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

2. The compound of claim **1**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein G has Formula (I'a) or (I'b):



(I'a)



(I'b)

3. The compound of claim **1** or **2**, or a pharmaceutically acceptable salt or a stereoisomer thereof,

when ring C is 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl,

R^4 is H, halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to

6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, $-NHR^8$, $-NR^8R^8$, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$,

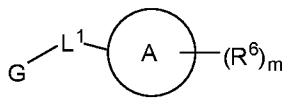
wherein each R^8 is independently H or C_{1-6} alkyl.

4. The compound of any one of claims **1-3**, or a pharmaceutically acceptable salt or a stereoisomer thereof,

wherein R^4 is halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, $-NHR^8$, $-NR^8R^8$, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$,

wherein each R^8 is independently H or C_{1-6} alkyl.

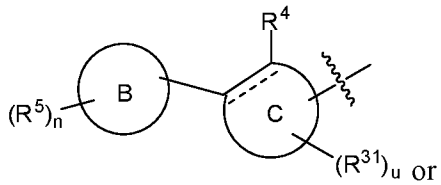
5. The compound of any one of claims **1-4**, having Formula (I'):



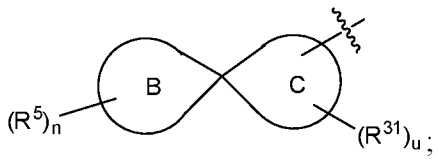
(I')

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

G has Formula (I'a) or (I'b)



or



;

(I'a) (I'b)

when G is of Formula (I'a), the atoms on ring C, to which the substituent R^4 and ring B are attached can be either carbon or nitrogen; and ---- is a single bond or a double bond;

when G is of Formula (I'b), ring B and ring C are joined together through a quaternary ring carbon atom to form a spiro structure and ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t-$, O, $-(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-$, $-O(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-(CR^{14}R^{15})_p-$, $-NR^{13}-$, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t-$, -NH-, $-(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t-$, $-CR^{13}=CR^{13}-$, $-C\equiv C-$, $-SO_2-$, $-(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}SO_2NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t-$, $-NR^{13}C(O)O-$, $-(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t-$, $-O(CO)NR^{13}-$, $-NR^{13}C(O)NR^{13}-$ or $-(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring C is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^4 is halo, oxo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl, or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4- to 6-membered heterocycloalkyl, 5- to 6-membered heteroaryl, phenyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN,

C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, 5- to 6-membered heteroaryl, phenyl, NH_2, $-NHR^8$, $-NR^8R^8$, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5, R^6 and R^{31} are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5, R^6 and R^{31} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered

heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^{31} substituents on ring C, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{31} substituents on the same ring carbon atom of ring C, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-

, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$ and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$, $NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$,

$NR^gS(O)_2NR^gR^g$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 independently selected R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-

, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 independently selected R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$ and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{6-10}

aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 independently selected R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$, $NR^kS(O)_2NR^kR^k$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4} haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4} alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl, 5- or 6-membered heteroaryl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

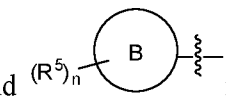
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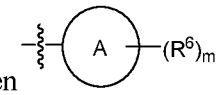
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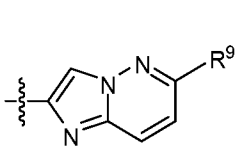
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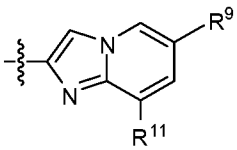
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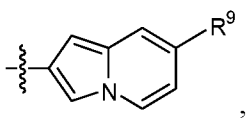
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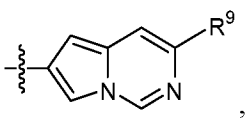
(i) when L^1 is a bond and 

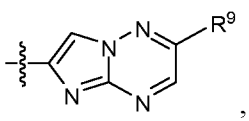
is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then 

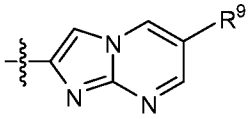
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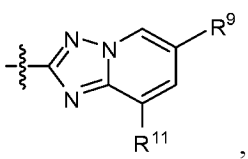
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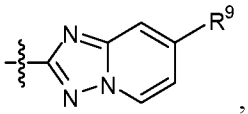
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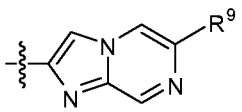
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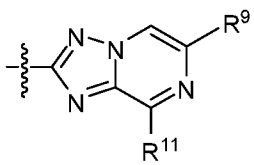
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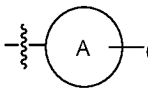
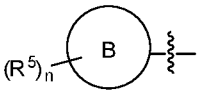
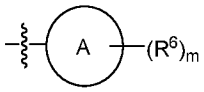
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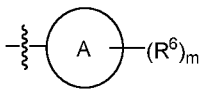
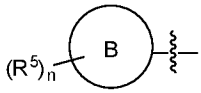
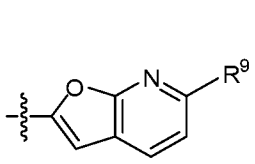
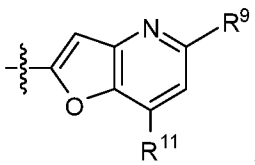
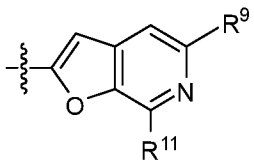
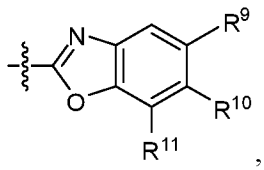
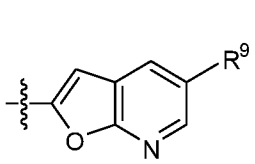
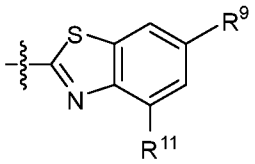
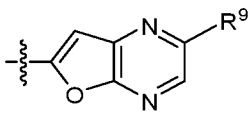
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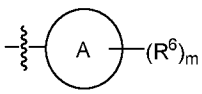
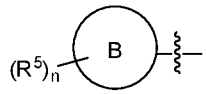
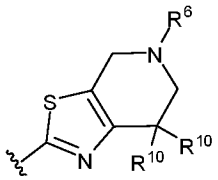
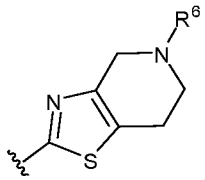
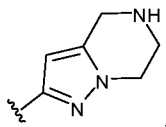
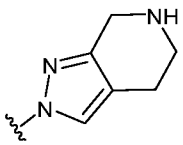
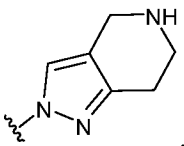
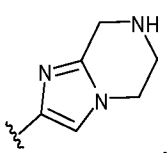
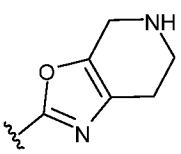
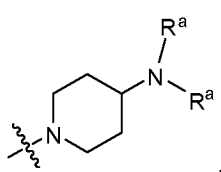
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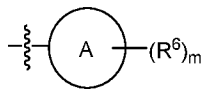
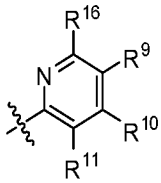
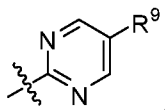
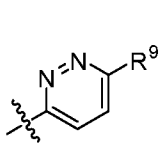
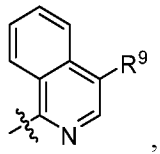
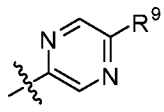
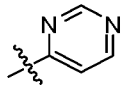
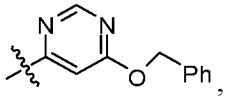
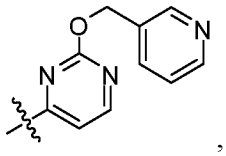
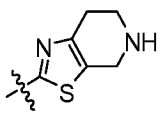
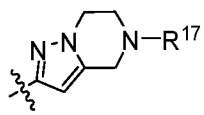
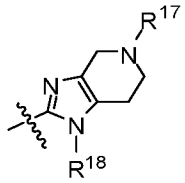
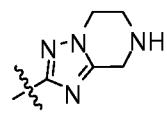
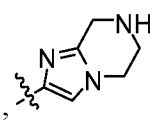
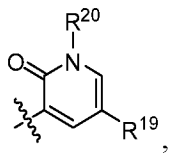
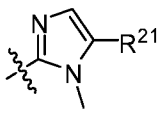
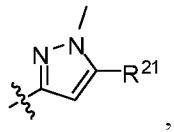
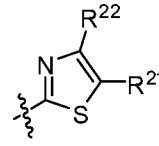
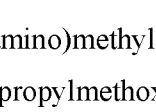
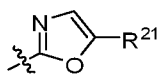
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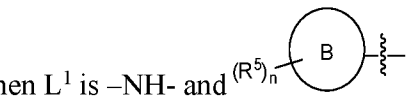
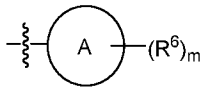
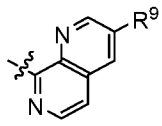
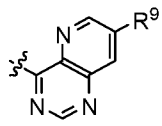
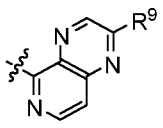
wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not any of the moieties set forth in proviso (i) above for ;

(iii) when L^1 is a bond then  or  is not , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  or  is not , , , , , ,  or , wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not , , , , , , , , , , , , , , , , ,  or , wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

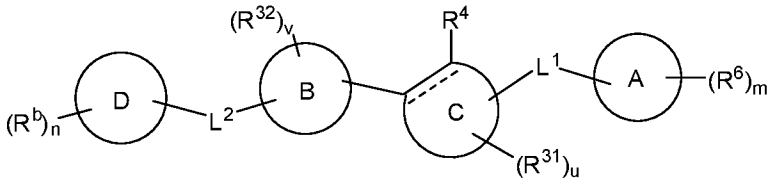
(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

6. The compound of any one of claims **1-5**, having Formula (I'c):



(I'c)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

ring D is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^2 is a bond, $–(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t-$, O, $-(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-$, $-O(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-(CR^{29}R^{30})_q-$, $-NR^{28}-$, $-(CR^{29}R^{30})_wNR^{28}(CR^{29}R^{30})_w-$, -NH-, $-(CR^{29}R^{30})_wNH(CR^{29}R^{30})_w-$, $-CR^{28}=CR^{28}-$, $—C\equiv C—$, $-SO_2-$, $-(CR^{29}R^{30})_wSO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wSO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}C(O)O(CR^{29}R^{30})_w-$, $-NR^{28}C(O)O-$, $-(CR^{29}R^{30})_wO(CO)NR^{28}(CR^{29}R^{30})_w-$, $-O(CO)NR^{28}-$, $–NR^{28}C(O)NR^{28}-$ or $-(CR^{29}R^{30})_wNR^{28}C(O)NR^{28}(CR^{29}R^{30})_w$;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $–N(C_{1-4}$ alkyl$)_2$;

R^{29} and R^{30} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form C_{3-6} cycloalkyl or 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

each R^{32} is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{32} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^{32} substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

the subscript n is an integer of 0, 1, 2, 3, 4, 5;

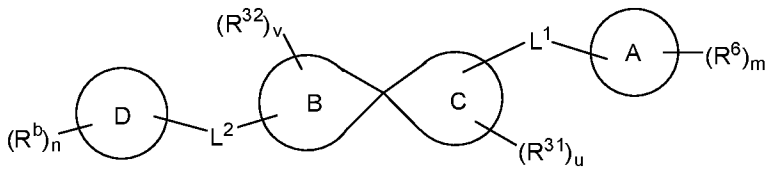
the subscript v is an integer of 0, 1, 2, 3, 4, 5, 6 or 7

each subscript q is independently an integer of 1, 2, 3 or 4;

each subscript t is independently an integer of 0, 1, 2, 3 or 4; and

each subscript w is independently an integer of 0, 1, 2, 3 or 4.

7. The compound of any one of claims **1-5**, having Formula (I'd):



(I'd)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

ring B and ring C are each independently 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

ring D is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 14-membered heterocycloalkyl or C_{3-14} cycloalkyl;

L^2 is a bond, $-(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t-$, $-(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t-$, O, $-(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-$, $-O(CR^{29}R^{30})_q-$, $-(CR^{29}R^{30})_q-O-(CR^{29}R^{30})_q-$, $-NR^{28}-$, $-(CR^{29}R^{30})_wNR^{28}(CR^{29}R^{30})_w-$, -NH-, $-(CR^{29}R^{30})_wNH(CR^{29}R^{30})_w-$, $-CR^{28}=CR^{28}-$, $-C\equiv C-$, $-SO_2-$, $-(CR^{29}R^{30})_wSO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wSO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}SO_2NR^{28}(CR^{29}R^{30})_w-$, $-(CR^{29}R^{30})_wNR^{28}C(O)O(CR^{29}R^{30})_w-$, $-NR^{28}C(O)O-$, $-(CR^{29}R^{30})_wO(CO)NR^{28}(CR^{29}R^{30})_w-$, $-O(CO)NR^{28}-$, $-NR^{28}C(O)NR^{28}-$ or $-(CR^{29}R^{30})_wNR^{28}C(O)NR^{28}(CR^{29}R^{30})_w$;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

R^{29} and R^{30} are each independently selected from H, halo, CN, OH, NH_2, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

each R^{32} is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-}

4 alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{32} are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^{32} substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^{32} substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

the subscript n is an integer of 0, 1, 2, 3, 4, 5;

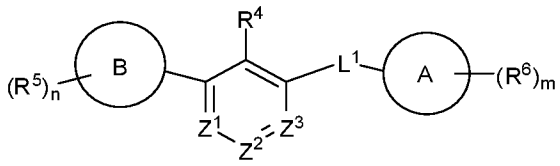
the subscript v is an integer of 0, 1, 2, 3, 4, 5, 6 or 7

each subscript q is independently an integer of 1, 2, 3 or 4;

each subscript t is independently an integer of 0, 1, 2, 3 or 4; and

each subscript w is independently an integer of 0, 1, 2, 3 or 4.

8. The compound of any one of claims **1-5**, having Formula (I):



(I)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

Z^1 is N or CR^1;

Z^2 is N or CR^2;

Z^3 is N or CR^3;

L^1 is a bond, $-(CR^{14}R^{15})_tC(O)NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)(CR^{14}R^{15})_t-$, O, $-(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-$, $-O(CR^{14}R^{15})_p-$, $-(CR^{14}R^{15})_p-O-(CR^{14}R^{15})_p-$, $-NR^{13}-$, $-(CR^{14}R^{15})_tNR^{13}(CR^{14}R^{15})_t-$, -NH-, $-(CR^{14}R^{15})_tNH(CR^{14}R^{15})_t-$, $-CR^{13}=CR^{13}-$, $-C\equiv C-$, $-SO_2-$, $-(CR^{14}R^{15})_tSO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tSO_2NR^{13}(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}SO_2(CR^{14}R^{15})_t-$, $-(CR^{14}R^{15})_tNR^{13}C(O)O(CR^{14}R^{15})_t-$, $-NR^{13}C(O)O-$, $-(CR^{14}R^{15})_tO(CO)NR^{13}(CR^{14}R^{15})_t-$, $-O(CO)NR^{13}-$, $-NR^{13}C(O)NR^{13}-$ or $-(CR^{14}R^{15})_tNR^{13}C(O)NR^{13}(CR^{14}R^{15})_t$;

ring A is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 11-membered heterocycloalkyl or C_{3-10} cycloalkyl;

ring B is C_{6-10} aryl, 5- to 14-membered heteroaryl, 4- to 11-membered heterocycloalkyl or C_{3-10} cycloalkyl;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, $-NHC_{1-4}$ alkyl and $-N(C_{1-4}$ alkyl$)_2$;

R^{14} and R^{15} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, $-NHC_{1-4}$ alkyl, $-N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{14} or R^{15} are each optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or R^{14} and R^{15} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

R^1, R^2 and R^3 are each independently selected from H, C_{1-4} alkyl, C_{3-10} cycloalkyl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl-, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, CN, OR^7, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, NH_2, $-NHR^7$, $-NR^7R^7$, $NHOR^7$, $C(O)R^7$, $C(O)NR^7R^7$, $C(O)OR^7$, $OC(O)R^7$, $OC(O)NR^7R^7$, $NR^7C(O)R^7$, $NR^7C(O)OR^7$, $NR^7C(O)NR^7R^7$, $C(=NR^7)R^7$, $C(=NR^7)NR^7R^7$, $NR^7C(=NR^7)NR^7R^7$, $NR^7S(O)R^7$, $NR^7S(O)_2R^7$, $NR^7S(O)_2NR^7R^7$, $S(O)R^7$, $S(O)NR^7R^7$, $S(O)_2R^7$, and $S(O)_2NR^7R^7$, wherein each R^7 is independently selected from H, C_{1-4} alkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, C_{1-4} alkoxy, C_{3-6} cycloalkyl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein

the C_{1-4} alkyl, C_{1-4} alkoxy, C_{3-10} cycloalkyl, C_{3-6} cycloalkyl-C_{1-4} alkyl-, C_{6-10} aryl, C_{6-10} aryl-C_{1-4} alkyl-, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^1, R^2, R^3 and R^7 are each optionally substituted with 1 or 2 independently selected R^d substituents;

R^4 is halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl or C_{3-6} cycloalkyl, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, 4 to 6-membered heterocycloalkyl and C_{3-6} cycloalkyl are each optionally substituted with 1, 2 or 3 substituents independently selected from halo, CN, C_{1-6} alkoxy, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 4 to 6-membered heterocycloalkyl, C_{3-6} cycloalkyl, phenyl, NH_2, -NHR^8, -NR^8R^8, $C(O)R^8$, $C(O)NR^8R^8$, $OC(O)NR^8R^8$, $NR^8C(O)R^8$, $NR^8C(O)OR^8$, $NR^8C(O)NR^8R^8$, $NR^8S(O)_2R^8$, $NR^8S(O)_2NR^8R^8$, $S(O)R^8$, $S(O)_2R^8$, and $S(O)_2NR^8R^8$, wherein each R^8 is independently H or C_{1-6} alkyl;

R^5 and R^6 are each independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^5 and R^6 are each optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

or two adjacent R^5 substituents on ring B, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^5 substituents on the same ring carbon atom of ring B, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered

heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two adjacent R^6 substituents on ring A, taken together with the atoms to which they are attached, form a fused phenyl ring, a fused 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused 5-, 6- or 7-membered heterocycloalkyl ring and fused 5- or 6-membered heteroaryl ring each have 1-4 heteroatoms as ring members selected from N, O and S and wherein the fused phenyl ring, fused 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

or two R^6 substituents on the same ring carbon atom of the ring A, taken together with the carbon atom to which they are attached, form a spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring, or a spiro C_{3-6} cycloalkyl ring, wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring has 1-4 heteroatoms as ring members selected from N, O and S and wherein the spiro 4-, 5-, 6- or 7-membered heterocycloalkyl ring and spiro C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^a are each optionally substituted with 1, 2 or 3 independently selected R^d substituents;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2, $NHOR^c$, OR^c, SR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, $OC(O)R^c$, $OC(O)NR^cR^c$, $C(=NR^c)NR^cR^c$, $NR^cC(=NR^c)NR^cR^c$, $NR^cC(=NOH)NR^cR^c$, $NR^cC(=NCN)NR^cR^c$, NHR^c,

NR^cR^c, $NR^cC(O)R^c$, $NR^cC(O)OR^c$, $NR^cC(O)NR^cR^c$, $NR^cS(O)R^c$, $NR^cS(O)_2R^c$, $NR^cS(O)_2NR^cR^c$, $S(O)R^c$, $S(O)NR^cR^c$, $S(O)_2R^c$ and $S(O)_2NR^cR^c$; wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^b are each further optionally substituted with 1, 2, or 3 independently selected R^d substituents;

or two R^b substituents attached to the same ring carbon atom taken together with the ring carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^f substituents;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^c are each optionally substituted with 1, 2 or 3 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^g$, OR^g, SR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, $OC(O)R^g$, $OC(O)NR^gR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, $NR^gC(O)NR^gR^g$, $NR^gC(O)OR^g$, $C(=NR^g)NR^gR^g$, $NR^gC(=NR^g)NR^gR^g$, $NR^gC(=NOH)NR^gR^g$, $NR^gC(=NCN)NR^gR^g$, $S(O)R^g$, $S(O)NR^gR^g$, $S(O)_2R^g$, $NR^gS(O)_2R^g$, $NR^gS(O)_2NR^gR^g$, and $S(O)_2NR^gR^g$; wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^f are each optionally substituted with 1, 2 or 3 R^n substituents;

each R^n is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, CN, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10

membered heterocycloalkyl)-C_{1-4} alkyl-, $NHOR^o$, OR^o, SR^o, $C(O)R^o$, $C(O)NR^oR^o$, $C(O)OR^o$, $OC(O)R^o$, $OC(O)NR^oR^o$, NHR^o, NR^oR^o, $NR^oC(O)R^o$, $NR^oC(O)NR^oR^o$, $NR^oC(O)OR^o$, $C(=NR^o)NR^oR^o$, $NR^oC(=NR^o)NR^oR^o$, $S(O)R^o$, $S(O)NR^oR^o$, $S(O)_2R^o$, $NR^oS(O)_2R^o$, $NR^oS(O)_2NR^oR^o$, and $S(O)_2NR^oR^o$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, phenyl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^n is optionally substituted with 1, 2 or 3 R^q substituents;

each R^d is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, halo, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NH_2, $NHOR^e$, OR^e, SR^e, $C(O)R^e$, $C(O)NR^eR^e$, $C(O)OR^e$, $OC(O)R^e$, $OC(O)NR^eR^e$, NHR^e, NR^eR^e, $NR^eC(O)R^e$, $NR^eC(O)NR^eR^e$, $NR^eC(O)OR^e$, $C(=NR^e)NR^eR^e$, $NR^eC(=NR^e)NR^eR^e$, $NR^eC(=NOH)NR^eR^e$, $NR^eC(=NCN)NR^eR^e$, $S(O)R^e$, $S(O)NR^eR^e$, $S(O)_2R^e$, $NR^eS(O)_2R^e$, $NR^eS(O)_2NR^eR^e$, and $S(O)_2NR^eR^e$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{6-10} aryl, 5-10 membered heteroaryl, C_{3-10} cycloalkyl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^d are each optionally substituted with 1, 2, or3 independently selected R^f substituents;

each R^e is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^e are each optionally substituted with 1, 2 or 3 independently selected R^f substituents;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^g are each optionally substituted with 1, 2, or 3 R^p substituents;

each R^p is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, halo, CN, $NHOR^r$, OR^r, SR^r, $C(O)R^r$, $C(O)NR^rR^r$, $C(O)OR^r$, $OC(O)R^r$, $OC(O)NR^rR^r$, NHR^r, NR^rR^r, $NR^rC(O)R^r$, $NR^rC(O)NR^rR^r$, $NR^rC(O)OR^r$, $C(=NR^r)NR^rR^r$, $NR^rC(=NR^r)NR^rR^r$, $NR^rC(=NOH)NR^rR^r$, $NR^rC(=NCN)NR^rR^r$, $S(O)R^r$, $S(O)NR^rR^r$, $S(O)_2R^r$, $NR^rS(O)_2R^r$, $NR^rS(O)_2NR^rR^r$ and $S(O)_2NR^rR^r$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-10 membered heteroaryl)-C_{1-4} alkyl- and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^p is optionally substituted with 1, 2 or 3 R^q substituents;

or any two R^a substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2 or 3 R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-7 membered heterocycloalkyl, C_{6-10} aryl, 5-6 membered heteroaryl, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-6 membered heteroaryl)-C_{1-4} alkyl-, (4-7 membered heterocycloalkyl)-C_{1-4} alkyl-, C_{6-10} aryl-C_{1-4} alkyl-, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, SR^i, $NHOR^i$, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, $OC(O)R^i$, $OC(O)NR^iR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, $NR^iC(O)NR^iR^i$, $NR^iC(O)OR^i$, $C(=NR^i)NR^iR^i$, $NR^iC(=NR^i)NR^iR^i$, $NR^iC(=NOH)NR^iR^i$, $NR^iC(=NCN)NR^iR^i$, $S(O)R^i$, $S(O)NR^iR^i$, $S(O)_2R^i$, $NR^iS(O)_2R^i$, $NR^iS(O)_2NR^iR^i$, and $S(O)_2NR^iR^i$, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{3-10} cycloalkyl, 4-7 membered heterocycloalkyl, C_{6-10} aryl, 5-6 membered heteroaryl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-6 membered heteroaryl)-C_{1-4} alkyl-, and (4-7 membered heterocycloalkyl)-C_{1-4} alkyl- of R^h are each optionally substituted by 1, 2, or 3 R^j substituents;

each R^j is independently selected from C_{1-4} alkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 5- or 6-membered heteroaryl, 4-6 membered heterocycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, halo, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, $NHOR^k$, OR^k, SR^k, $C(O)R^k$, $C(O)NR^kR^k$, $C(O)OR^k$, $OC(O)R^k$, $OC(O)NR^kR^k$, NHR^k, NR^kR^k, $NR^kC(O)R^k$, $NR^kC(O)NR^kR^k$, $NR^kC(O)OR^k$, $C(=NR^k)NR^kR^k$, $NR^kC(=NR^k)NR^kR^k$, $S(O)R^k$, $S(O)NR^kR^k$, $S(O)_2R^k$, $NR^kS(O)_2R^k$, $NR^kS(O)_2NR^kR^k$, and $S(O)_2NR^kR^k$, wherein the C_{1-4} alkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 5- or 6-membered heteroaryl, 4-6 membered heterocycloalkyl, C_{2-4} alkenyl, C_{1-4} haloalkyl, and C_{1-4}

haloalkoxy of R^j are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or two R^h groups attached to the same carbon atom of the 4- to 10-membered heterocycloalkyl, taken together with the carbon atom to which they are attached, form a C_{3-6} cycloalkyl or 4- to 6-membered heterocycloalkyl having 1-2 heteroatoms as ring members selected from O, N or S;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^e substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^g substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

or any two R^o substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents; and

or any two R^r substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^i, R^k, R^o or R^r is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{1-4} haloalkyl, C_{2-4} alkenyl, and C_{2-4} alkynyl, wherein the C_{1-4} alkyl, C_{1-6} haloalkyl, C_{3-6} cycloalkyl, C_{6-10} aryl, 4-6 membered heterocycloalkyl, 5 or 6-membered heteroaryl, C_{2-4} alkenyl, and C_{2-4} alkynyl of R^i, R^k, R^o or R^r are each optionally substituted with 1, 2 or 3 R^q substituents;

each R^q is independently selected from OH, CN, -COOH, NH_2, halo, C_{1-6} haloalkyl, C_{1-6} alkyl, C_{1-6} alkoxy, C_{1-6} haloalkoxy, C_{1-6} alkylthio, phenyl, 5-6 membered heteroaryl, 4-6 membered heterocycloalkyl, C_{3-6} cycloalkyl, NHR^{12} and $NR^{12}R^{12}$, wherein the C_{1-6} alkyl, phenyl, C_{3-6} cycloalkyl, 4-6 membered heterocycloalkyl, and 5-6 membered heteroaryl of R^q are each optionally substituted with halo, OH, CN, -COOH, NH_2, C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, phenyl, C_{3-10} cycloalkyl and 4-6 membered heterocycloalkyl and each R^{12} is independently C_{1-6} alkyl;

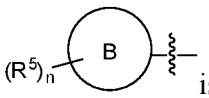
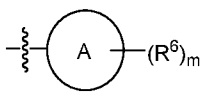
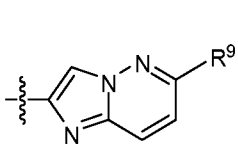
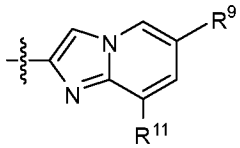
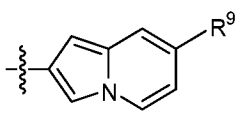
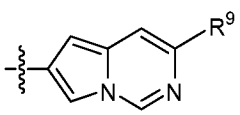
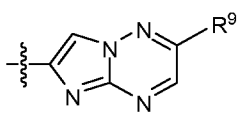
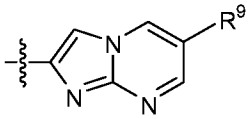
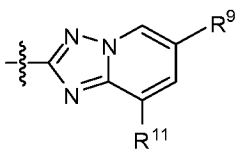
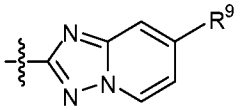
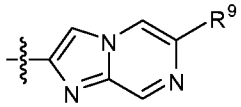
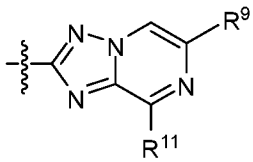
the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

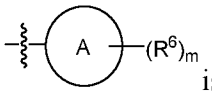
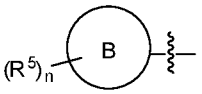
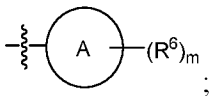
each subscript p is independently an integer of 1, 2, 3 or 4;

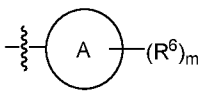
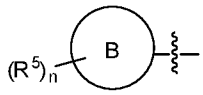
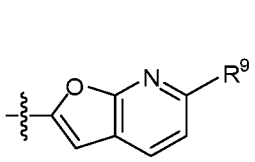
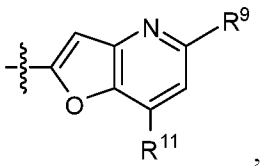
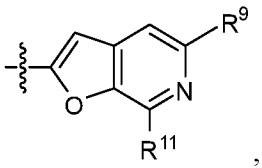
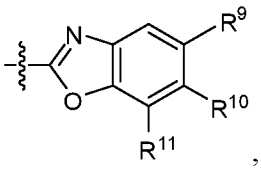
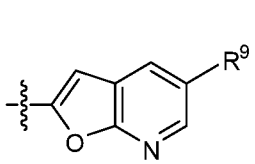
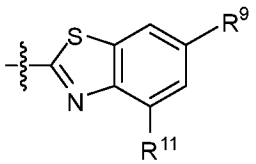
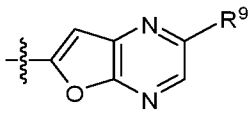
each subscript t is independently an integer of 0, 1, 2, 3 or 4;

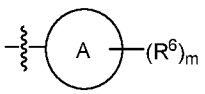
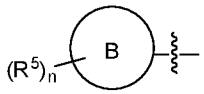
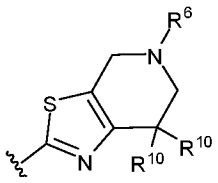
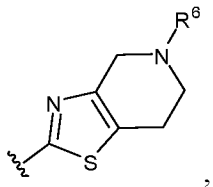
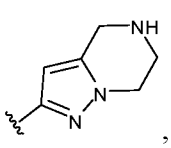
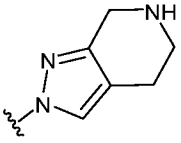
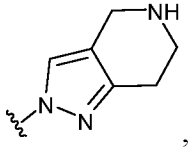
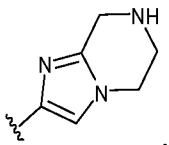
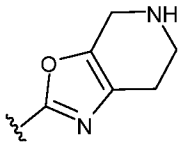
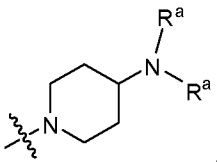
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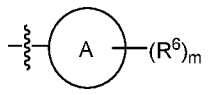
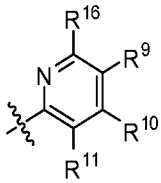
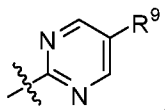
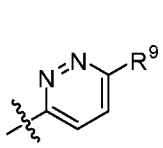
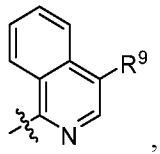
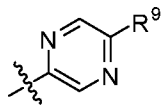
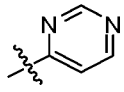
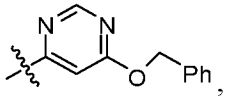
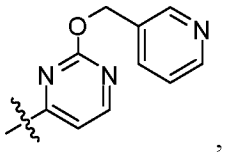
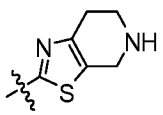
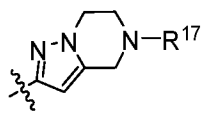
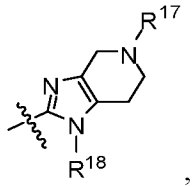
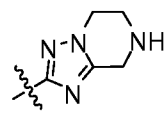
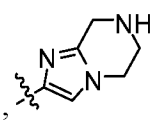
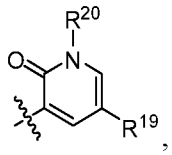
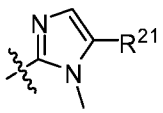
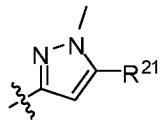
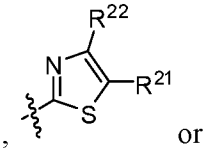
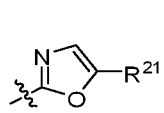
(i) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not , , , , , , , ,  or ,

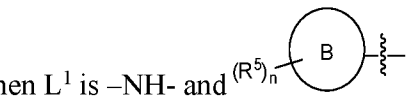
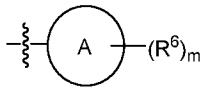
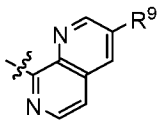
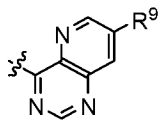
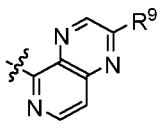
wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl and each R^{11} is independently H, halo, CN, C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl or benzyloxy, wherein the C_{1-6} alkyl, C_{1-6} alkoxy, -NHC_{1-6} alkyl and benzyloxy of R^{11} are each optionally substituted with halo, CN, C_{1-6} alkyl or C_{1-6} alkoxy;

(ii) when L^1 is a bond and  is phenyl or 2,3-dihydro-1,4-benzodioxin-6-yl, then  is not any of the moieties set forth in proviso (i) above for ;

(iii) when L^1 is a bond, then  or  is not , , , , ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; each R^{11} is independently H or C_{1-6} alkyl and R^{10} is H, C_{1-6} alkoxy, benzyloxy, morpholinoethoxy or 2-pyridylmethyloxy, wherein the C_{1-6} alkoxy, benzyloxy and 2-pyridylmethyloxy of R^{10} are each optionally substituted with CN;

(iv) when L^1 is a bond, then  or  is not , , , , , ,  or , wherein R^{10} is H or C_{1-6} alkyl;

(v) when L^1 is –NHC(O)-, then  is not , , , , , , , , , , , , , , , , , , , or , wherein each R^9 is independently H, methyl, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{10} is H, methyl, CN, methoxy, cyclopropylmethoxy, benzyloxy, (2-cyanophenyl)methoxy, 2-pyridylmethoxy, 3-pyridylmethoxy, (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{11} is H, halo, methyl or dimethylamino; R^{16} is H or methyl; each R^{17} is independently H, 2-hydroxyethyl or carboxymethyl; R^{18} is H or methyl; R^{19} is (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; R^{20} is C_{1-6} alkyl; each R^{21} is independently 2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl; and R^{22} is H or Cl;

(vi) when L^1 is –NH- and  is phenyl, 2,3-dihydro-1,4-benzodioxin-6-yl, cyclohexyl or 1-cyclohexenyl, then  is not ,  or , wherein each R^9 is independently (2-hydroxyethylamino)methyl or (2-carboxy-1-piperidinyl)methyl;

(vii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 1 or 2, then R^5 is not a substituent independently selected from H, $-OCH_3$, -OH, $-OCH_2CH_3$, $-O(CH_2)OCH_3$, $-OCH_2CH=CH_2$, $-O(CH_2)_2CH_3$, $-O(CH_2)_2$morpholinyl or F; and

(viii) when L^1 is $–CH_2O-$, ring B is phenyl or thienyl, and the subscript n is 2, then two R^5 substituents attached to adjacent ring carbon atoms of ring B do not form $–OCH_2O-$ or $–OCH_2CH_2O-$; and

wherein the compound, or a pharmaceutically acceptable salt or a stereoisomer thereof inhibits PD-1/PD-L1 interaction.

9. The compound of any one of claims **1-8**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

any two R^i substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^q substituents;

or any two R^k substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, 7-, 8-, 9- or 10-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^q substituents.

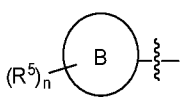
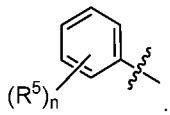
10. The compound of any one of claims **1-9**, or a pharmaceutically acceptable salt or a stereoisomer thereof, having an IC_{50} of less than 1 μM in a PD-L1 binding assay.

11. The compound of any one of claims **1-10**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein

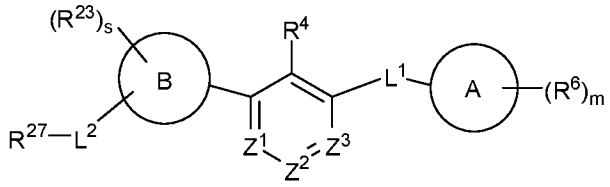
the subscript m is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8 and the subscript n is an integer of 1, 2, 3, 4, 5, 6, 7 or 8;

or the subscript m is an integer of 1, 2, 3, 4, 5, 6, 7 or 8 and the subscript n is an integer of 0, 1, 2, 3, 4, 5, 6, 7 or 8;

or the subscripts m and n are each independently an integer of 1, 2, 3, 4, 5, 6, 7 or 8.

12. The compound of any one of claims **1-6** and **8-11**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein  is .

13. The compound of any one of claims **1-6** and **8-11**, having Formula (II):



(II)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^2 is a bond, $-(CR^{29}R^{30})_tC(O)NR^{28}(CR^{29}R^{30})_t$-, -$(CR^{29}R^{30})_tNR^{28}C(O)(CR^{29}R^{30})_t$ -, O, -$(CR^{29}R^{30})_q$-, -$(CR^{29}R^{30})_q$-O-, -O$(CR^{29}R^{30})_q$-, -$(CR^{29}R^{30})_q$-O-$(CR^{29}R^{30})_q$-, -NR^{28}-, -$(CR^{29}R^{30})_tNR^{28}(CR^{29}R^{30})_t$ -, -NH-, -$(CR^{29}R^{30})_tNH(CR^{29}R^{30})_t$-, -CH=CH-, —C≡C—, -$SO_2$-, -$(CR^{29}R^{30})_tSO_2(CR^{29}R^{30})_t$ -, -$(CR^{29}R^{30})_tSO_2NR^{28}(CR^{29}R^{30})_t$ -, -$(CR^{29}R^{30})_tNR^{28}SO_2(CR^{29}R^{30})_t$ -, -$(CR^{29}R^{30})_tNR^{28}C(O)O(CR^{29}R^{30})_t$ -, -$NR^{28}C(O)O$-, -$(CR^{29}R^{30})_tO(CO)NR^{28}(CR^{29}R^{30})_t$ -, -$O(CO)NR^{28}$-, $-NR^{28}C(O)NR^{28}$- or -$(CR^{29}R^{30})_tNR^{28}C(O)NR^{28}(CR^{29}R^{30})_t$;

each R^{23} is independently C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, -NHC_{1-4} alkyl or $-N(C_{1-4}$ alkyl$)_2$;

R^{27} is C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-11 membered heterocycloalkyl, each of which is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents;

each R^{28} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl optionally substituted with a substituent selected from C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, CN, halo, OH, -COOH, NH_2, -NHC_{1-4} alkyl and $-N(C_{1-4}$ alkyl$)_2$;

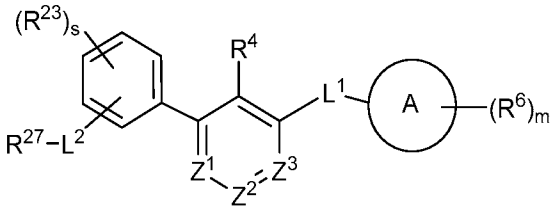
R^{29} and R^{30} are each independently selected from H, halo, CN, OH, -COOH, C_{1-4} alkyl, C_{1-4} alkoxy, -NHC_{1-4} alkyl, -$N(C_{1-4}$ alkyl$)_2$, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl, wherein the C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} haloalkyl, C_{1-4} haloalkoxy, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl and 4-6 membered heterocycloalkyl of R^{29} or R^{30} are each optionally substituted with 1, 2 or 3 independently selected R^q substituents;

or R^{29} and R^{30} taken together with the carbon atom to which they are attached form spiro C_{3-6} cycloalkyl or spiro 4- to 7-membered heterocycloalkyl, each of which is optionally substituted with 1, 2, or 3 independently selected R^q substituents;

the subscript s is an integer of 0, 1, 2, 3 or 4; and

each subscript q is independently an integer of 1, 2, 3 or 4.

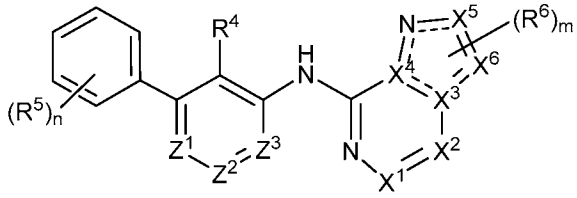
14. The compound of claim **13**, having Formula (IIa):



(IIa)

or a pharmaceutically acceptable salt or a stereoisomer thereof.

15. The compound of claim **8,** having Formula (III):



(III)

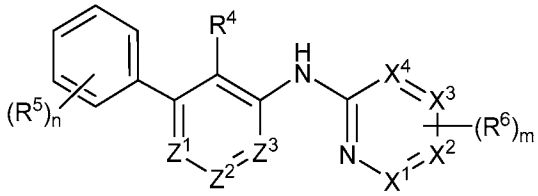
or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4 and X^6 are each independently C or N, with the proviso that no more than two of X^1, X^2, X^3 and X^4 are simultaneously N;

X^5 is C, N, O or S;

==== is a single or a double bond to maintain the fused 5- and 6-membered rings being aromatic.

16. The compound of claim **8**, having Formula (IV):

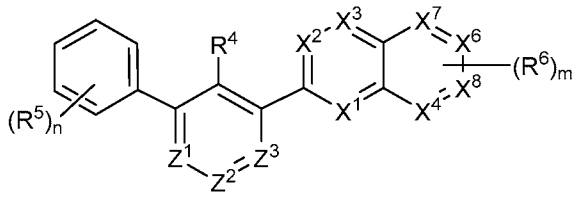


(IV)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3 and X^4 are each independently C or N, with the proviso that no more than two of X^1, X^2, X^3 and X^4 are simultaneously N.

17. The compound of claim **8**, having Formula (V):

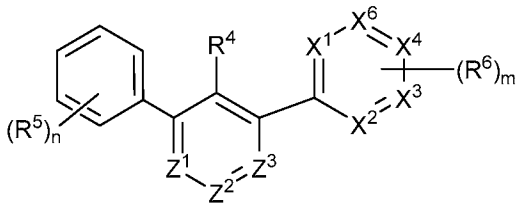


(V)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4, X^6, X^7 and X^8 are each independently C or N, with the proviso that no more than three of X^4, X^6, X^7 and X^8 are simultaneously N.

18. The compound of claim **8**, having Formula (VI):

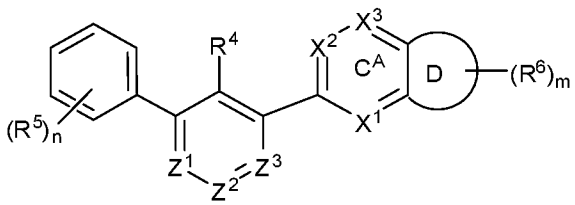


(VI)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^3, X^4 and X^6 are each independently C or N, with the proviso that no more than three of X^1, X^2, X^3, X^4 and X^6 are simultaneously N.

19. The compound of claim **8**, having Formula (VII):



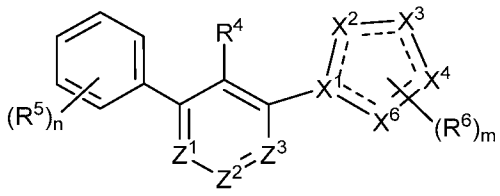
(VII)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2 and X^3 are each independently C or N; and

ring C^A is aromatic and ring D is fused 5- or 6-membered heterocycloalkyl.

20. The compound of claim **8**, having Formula (VIII):



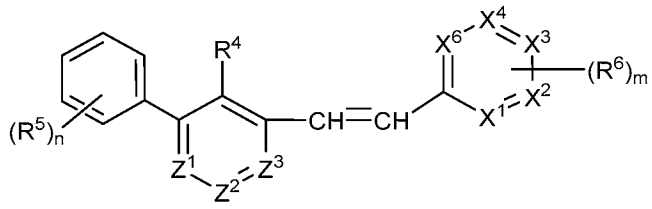
(VIII)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1 is N or C;

X^2, X^3, X^4 and X^6 are each independently C, N, or O to maintain the 5-membered ring A being aromatic.

21. The compound of claim **8**, having Formula (IX):



(IX)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

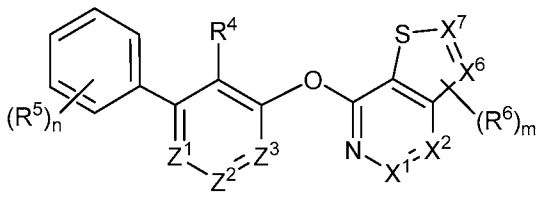
X^1, X^2 and X^3 are each independently C or N;

X^4 is CR^{24} or N;

X^6 is CR^{25} or N;

or R^{24} and R^{25} together with the carbon atoms to which they are attached form a fused phenyl ring, a fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, a fused 5- or 6-membered heteroaryl ring or a fused C_{3-6} cycloalkyl ring, wherein the fused phenyl ring, fused 4-, 5-, 6- or 7-membered heterocycloalkyl ring, fused 5- or 6-membered heteroaryl ring and fused C_{3-6} cycloalkyl ring are each optionally substituted with 1, 2 or 3 R^b substituents.

22. The compound of claim 8, having Formula (X):

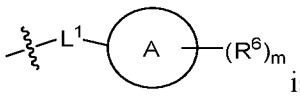


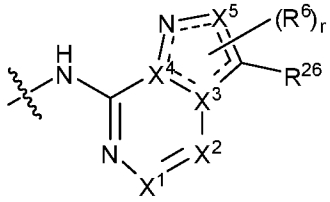
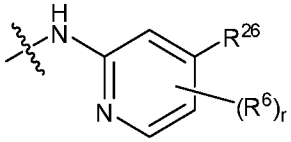
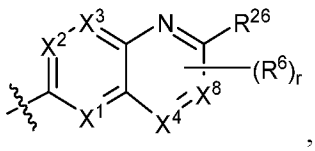
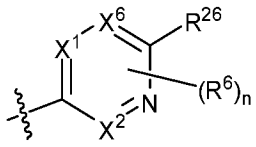
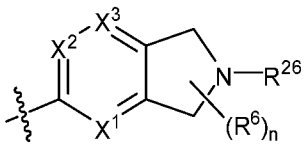
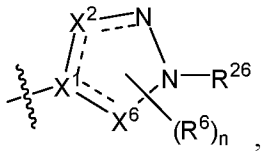
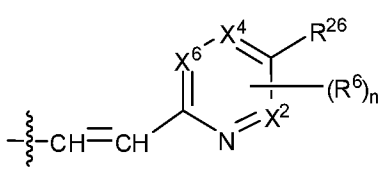
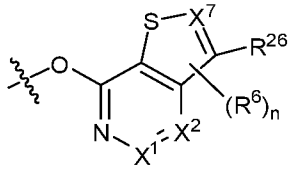
(X)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

X^1, X^2, X^6 and X^7 are each independently C or N.

23. The compound of any of claims **8-22**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein Z^1 is CR^1, Z^2 is CR^2 and Z^3 is CR^3.

24. The compound of any one of claims **1-14**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein  is selected from:

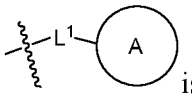
and , wherein

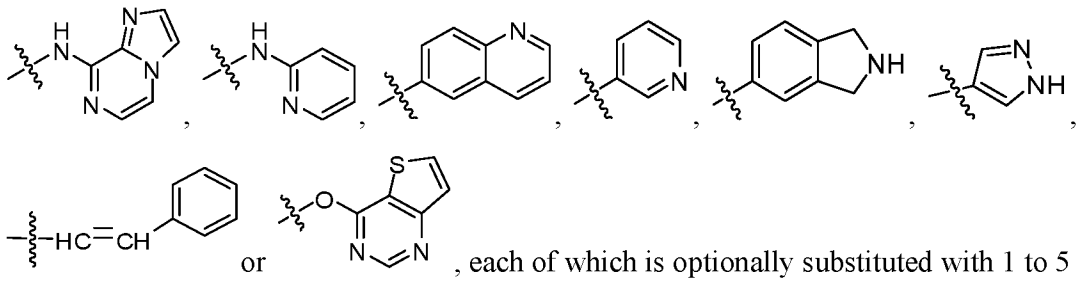
X^1, X^2, X^3, X^4, X^6, X^7 and X^8 are each independently C or N;

X^5 is C, N, O or S;

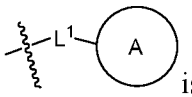
each R^{26} is independently selected from H, halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, SR^a, $NHOR^a$, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, $OC(O)R^a$, $OC(O)NR^aR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, $NR^aC(O)OR^a$, $NR^aC(O)NR^aR^a$, $C(=NR^a)R^a$, $C(=NR^a)NR^aR^a$, $NR^aC(=NR^a)NR^aR^a$, $NR^aC(=NOH)NR^aR^a$, $NR^aC(=NCN)NR^aR^a$, $NR^aS(O)R^a$, $NR^aS(O)_2R^a$, $NR^aS(O)_2NR^aR^a$, $S(O)R^a$, $S(O)NR^aR^a$, $S(O)_2R^a$, and $S(O)_2NR^aR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{6-10} aryl, C_{3-10} cycloalkyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, C_{6-10} aryl-C_{1-4} alkyl-, C_{3-10} cycloalkyl-C_{1-4} alkyl-, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^{26} is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^b substituents; and

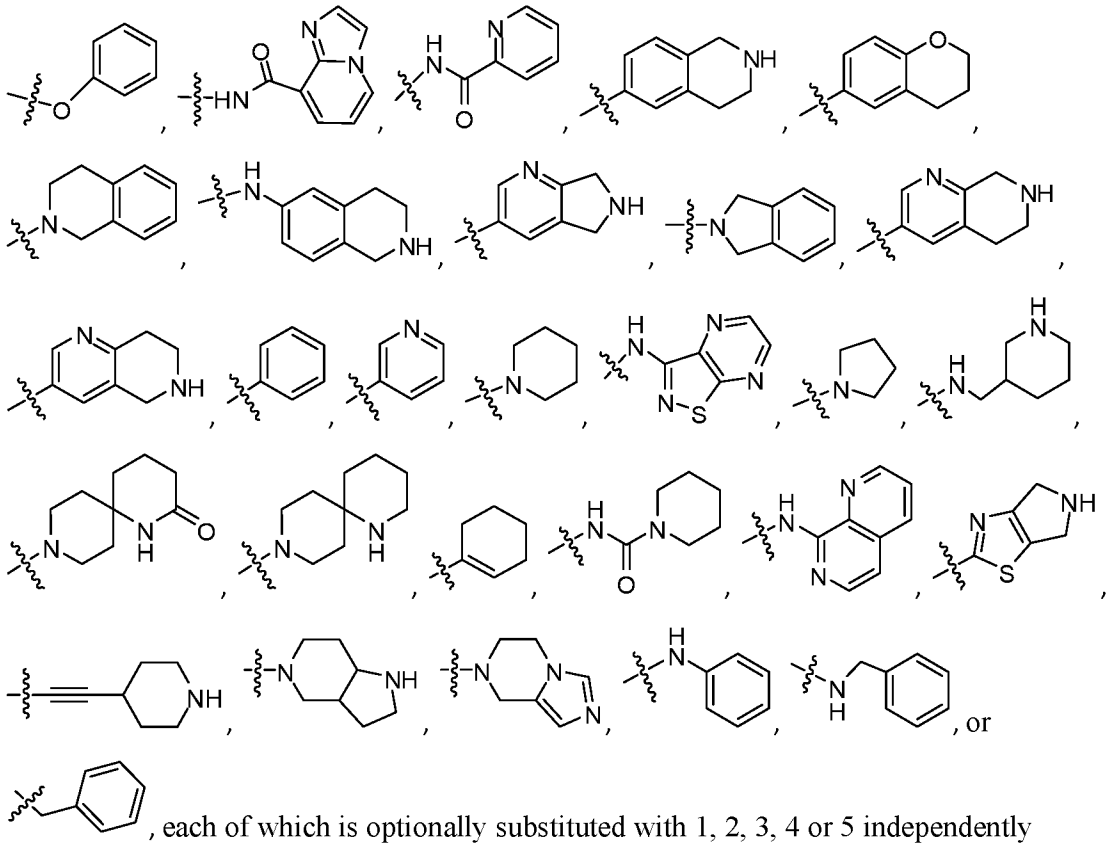
each subscript r is independently an integer of 1, 2, 3, 4, 5, 6 or 7.

25. The compound of any one of claims **1-14**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein  is selected from:

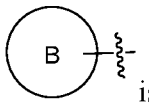


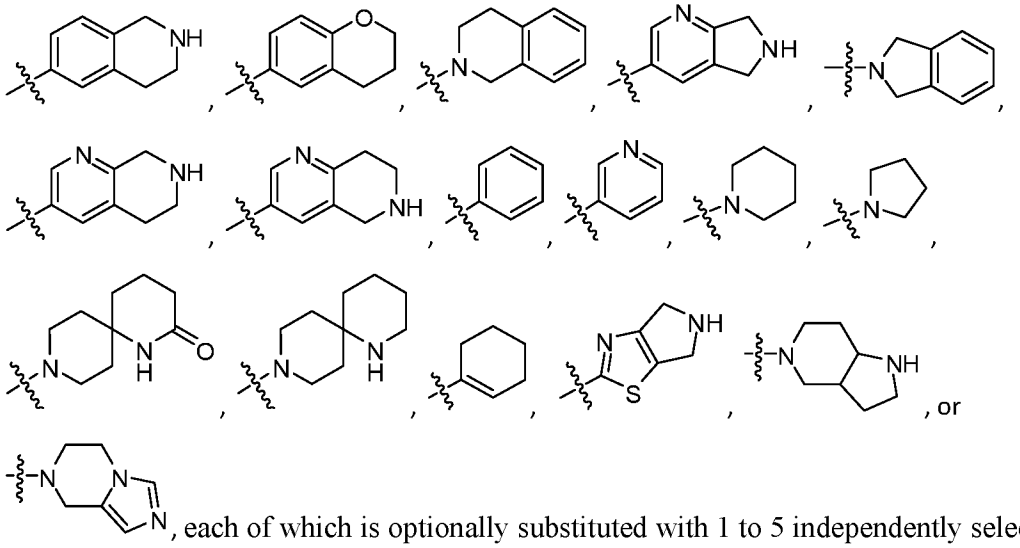
 or , each of which is optionally substituted with 1 to 5 independently selected R^6 substituents.

26. The compound of any one of claims **1-14**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein  is selected from:

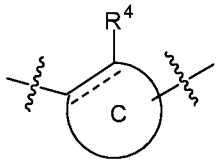
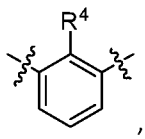


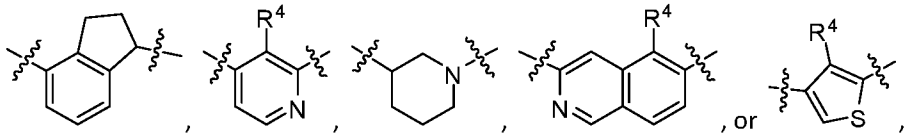
, each of which is optionally substituted with 1, 2, 3, 4 or 5 independently selected R^6 substituents.

27. The compound of any one of claims **1-11**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein ring B:  is selected from:



each of which is optionally substituted with 1 to 5 independently selected R^5 substituents.

28. The compound of any one of claims **1-6, 9-12** and **24-27**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein  is: ,

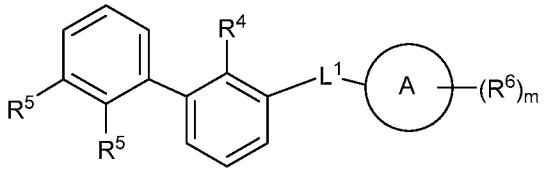
 each of which is optionally substituted with 1, 2 or 3 independently selected R^{31} substituents.

29. The compound of any of claims **1-14** and **27-28**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein L^1 is a bond, –O-, -NHC(O)-, -NH-,-CH_2NH-, or –CH_2-.

30. The compound of any of claims **6, 7, 9-14** and **23-29**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein L^2 is a bond.

31. The compound of any of claims **1, 9-12** and **24-30**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein L^3 is a bond, –O-, -NHC(O)-, -NH-,-CH_2NH-, or –CH_2-.

32. A compound of Formula (XI):

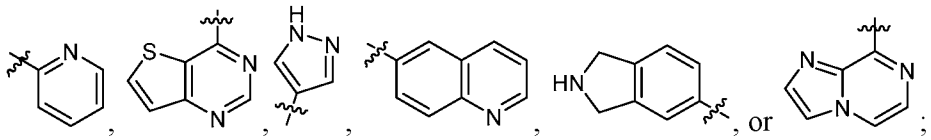


(XI)

or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, $-NR^{13}-$, or -CH=CH-;

ring A is



wherein ~~~ indicates the point of attachment of ring A to L^1;

each R^{13} is independently H, C_{1-6} haloalkyl or C_{1-6} alkyl;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, NO_2, OR^a, $C(O)R^a$, $C(O)NR^aR^a$, $C(O)OR^a$, NHR^a, NR^aR^a, $NR^aC(O)R^a$, and $NR^aC(O)OR^a$, wherein the C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, 5-14 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-14 membered heteroaryl)-C_{1-4} alkyl-, and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, CN, OH, NH_2, NO_2,OR^c, $C(O)R^c$, $C(O)NR^cR^c$, $C(O)OR^c$, NHR^c, NR^cR^c, $NR^cC(O)R^c$, and $NR^cC(O)OR^c$;

each R^c is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl, wherein the C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl R^c are each optionally substituted with 1, 2 or 3 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^g, $C(O)R^g$, $C(O)NR^gR^g$, $C(O)OR^g$, NHR^g, NR^gR^g, $NR^gC(O)R^g$, and $NR^gC(O)OR^g$;

each R^g is independently selected from H, C_{1-6} alkyl, C_{1-6} haloalkyl, C_{2-6} alkenyl, and C_{2-6} alkynyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is independently selected from C_{1-6} alkyl, C_{1-6} haloalkyl, C_{1-6} haloalkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, halo, CN, OR^i, $C(O)R^i$, $C(O)NR^iR^i$, $C(O)OR^i$, NHR^i, NR^iR^i, $NR^iC(O)R^i$, and $NR^iC(O)OR^i$;

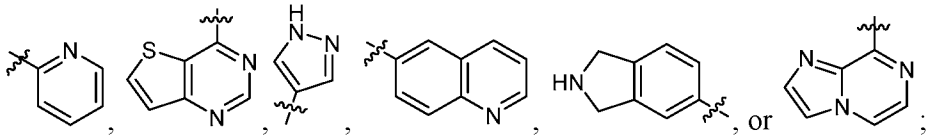
each R^i is independently selected from H, C_{1-6} alkyl, and C_{1-6} haloalkyl; and

the subscript m is an integer of 0, 1, 2, or 3.

33. The compound of claim **32**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein:

L^1 is a bond, O, -NH-, or -CH=CH-;

ring A is



, or ;

wherein ~~~ indicates the point of attachment of ring A to L^1;

R^4 is halo or C_{1-6} alkyl;

each R^5 is independently selected from halo and OR^a;

each R^6 is independently selected from halo, C_{1-6} alkyl, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, and OR^a, wherein the C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1, 2 or 3 independently selected R^b substituents;

each R^a is independently selected from H and C_{1-6} alkyl;

each R^b substituent is independently selected from halo, C_{1-6} alkyl, 5-10 membered heteroaryl, 4-10 membered heterocycloalkyl, (5-10 membered heteroaryl)-C_{1-4} alkyl-, (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, $C(O)OR^c$, NHR^c, and NR^cR^c;

each R^c is independently selected from H and C_{1-6} alkyl, wherein the C_{1-6} alkyl is optionally substituted with 1 or 2 R^f substituents;

each R^f is independently selected from C_{1-6} alkyl and OR^g;

each R^g is independently selected from H and C_{1-6} alkyl;

or any two R^c substituents together with the nitrogen atom to which they are attached form a 4-, 5-, 6-, or 7-membered heterocycloalkyl group optionally substituted with 1, 2, or 3 independently selected R^h substituents;

each R^h is $C(O)OR^i$;

each R^i is independently selected from H and C_{1-6} alkyl; and

the subscript m is an integer of 0, 1, 2, or 3.

34. The compound of claim **32** or **33**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein R^4 is C_{1-6} alkyl.

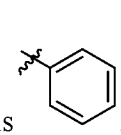
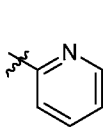
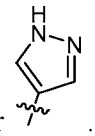
35. The compound of claim **32** or **33**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein R^4 is halo.

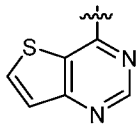
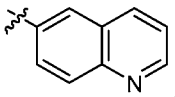
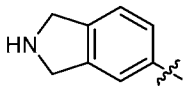
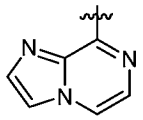
36. The compound of any one of claims **32-35**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein R^5 is OR^a.

37. The compound of any one of claims **32-35**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein R^5 is halo.

38. The compound of any one of claims **32-37**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein each R^6 is independently selected from C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl-, wherein the C_{1-6} alkyl and (4-10 membered heterocycloalkyl)-C_{1-4} alkyl- of R^6 are each optionally substituted with 1 or 2 independently selected R^b substituents.

39. The compound of any one of claims **32-37**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein each R^6 is 2-hydroxyethylaminomethyl, pyrrolidin-2-ylmethyl, methylpiperidine-2-carboxylic acid, or aminomethyl.

40. The compound of any one of claims **32-39**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein ring A is , , or .

41. The compound of any one of claims **32-39**, or a pharmaceutically acceptable salt or a stereoisomer thereof, wherein ring A is , , , or .

42. The compound of claim 1 selected from:

2-((4-(2-methylbiphenyl-3-yloxy)thieno[3,2-d]pyrimidin-7-yl)methylamino)ethanol;

4-(2-methylbiphenyl-3-yl)-1-[(2S)-pyrrolidin-2-ylmethyl]-1H-pyrazole;

2-((2-(2-chloro-2'-fluoro-3'-methoxybiphenyl-3-ylamino)-3-fluoropyridin-4-yl)methylamino)ethanol;

(S)-1-((4-methyl-6-(2-methylbiphenyl-3-yl)quinolin-2-yl)methyl)piperidine-2-carboxylic acid;

5-(2-methylbiphenyl-3-yl)isoindoline;

(5-(2-chlorobiphenyl-3-yl)pyridin-2-yl)methanamine;

2-{[(2'-methyl-1,1':3',1"-terphenyl-4-yl)methyl]amino}ethanol;

(R,E)-1-((6-(2-(2-methyl-[1,1'-biphenyl]-3-yl)vinyl)pyridin-3-yl)methyl)piperidine-2-carboxylic acid; and

2-(((8-((2'-fluoro-3'-methoxy-2-methyl-[1,1'-biphenyl]-3-yl)amino)imidazo[1,2-a]pyrazin-3-yl)methyl)amino)ethan-1-ol;

or a pharmaceutically acceptable salt or a stereoisomer thereof.

43. The compound of claim **1**, selected from:

(2S)-1-(3-methyl-4-(4-phenyl-2,3-dihydro-1H-inden-1-yloxy)benzyl)piperidine-2-carboxylic acid;

(S)-1-((8-(2-methylbiphenyl-3-ylcarbamoyl)imidazo[1,2-a]pyridin-3-yl)methyl)piperidine-2-carboxylic acid;

N-(5-chloro-3-phenylisoquinolin-6-yl)-5-((2-hydroxyethylamino)methyl) picolinamide;

6-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinoline;

2-((2-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-yl)methylamino)ethanol;

N-(2-methylbiphenyl-3-yl)-1,2,3,4-tetrahydroisoquinolin-6-amine;

N,N-dimethyl-1-(6-(2-methylbiphenyl-3-yl)chroman-2-yl)methanamine;

3-(2-methylbiphenyl-3-yl)-6,7-dihydro-5H-pyrrolo[3,4-b]pyridine;

2-(6-(2-methylbiphenyl-3-ylamino)-3,4-dihydroisoquinolin-2(1H)-yl)propane-1,3-diol;

2-((2-(2-methylbiphenyl-3-yl)isoindolin-5-yl)methylamino)ethanol;

3-(2-methylbiphenyl-3-yl)-5,6,7,8-tetrahydro-1,6-naphthyridine;

(4-(3-methyl-4-phenylpyridin-2-yl)phenyl)methanamine;

Cis-4-((5-(3-phenylpiperidin-1-yl)pyridin-2-yl)methylamino)cyclohexanol;

(1-((1-(2-chloro-3-(phenylamino)phenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol;

(1-((1-(3-(benzylamino)-2-chlorophenyl)piperidin-4-ylamino)methyl)cyclobutyl)methanol;

N-(2-methylbiphenyl-3-yl)isothiazolo[4,5-b]pyrazin-3-amine;

(R)-1-(2-methylbiphenyl-3-yl)piperidin-3-amine;

(1-(2-methylbiphenyl-3-yl)piperidin-4-yl)methanamine;

2-methyl-N-(piperidin-3-ylmethyl)biphenyl-3-amine;

(R)-(1-(2-methylbiphenyl-3-yl)pyrrolidin-3-yl)methanamine;

9-(2-methylbiphenyl-3-yl)-1,9-diazaspiro[5.5]undecan-2-one;

9-(2-methylbiphenyl-3-yl)-1,9-diazaspiro[5.5]undecane;

1-(4-(2-methylbiphenyl-3-yl)cyclohex-3-enyl)pyrrolidine;

3-amino-N-(2-methylbiphenyl-3-yl)piperidine-1-carboxamide;

2-[(3-{[(2-hydroxyethyl)amino]methyl}-1,7-naphthyridin-8-yl)amino]-4-phenylthiophene-3-carbonitrile;

(R)-2-(dimethylamino)-1-(2-(3'-(5-(2-(3-hydroxypyrrolidin-1-yl)acetyl)-5,6-dihydro-4H-pyrrolo[3,4-d]thiazol-2-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)ethanone;

1-(2-(2,2'-dimethyl-3'-(piperidin-4-ylethynyl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone;

1-(2-(2,2'-dimethyl-3'-(tetrahydro-1H-pyrrolo[3,2-c]pyridin-5(6H,7H,7aH)-yl)biphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone;

1-(2-(3'-(5,6-dihydroimidazo[1,5-a]pyrazin-7(8H)-yl)-2,2'-dimethylbiphenyl-3-yl)-4H-pyrrolo[3,4-d]thiazol-5(6H)-yl)-2-(ethyl(methyl)amino)ethanone;

2-(2'-fluoro-3'-methoxy-2-methylbiphenyl-3-ylamino)-*N*-(2-(2-hydroxyethylamino)ethyl)nicotinamide; and

2-({3-chloro-4-[(4-phenyl-2,3-dihydro-1H-indol-1-yl)methyl]benzyl}amino)ethanol; or a pharmaceutically acceptable salt or a stereoisomer thereof.

44. A pharmaceutical composition comprising a compound of any one of claims **1-43**, or a pharmaceutically acceptable salt or a stereoisomer thereof, and one or more pharmaceutically acceptable excipient or carrier.

45. A method of inhibiting PD-1/PD-L1 interaction, said method comprising administering to a patient a compound of any one of claims **1-43**, or a pharmaceutically acceptable salt or a stereoisomer thereof.

46. A method of treating a disease or disorder associated with inhibition of PD-1/PD-L1 interaction, said method comprising administering to a patient in need thereof a therapeutically effective amount of a compound of any one of claims **1-43**, or a pharmaceutically acceptable salt or a stereoisomer thereof.

47. A method of enhancing, stimulating and/or increasing the immune response in a patient, said method comprising administering to the patient in need thereof a therapeutically effective amount of a compound of any one of claims **1-43**, or a pharmaceutically acceptable salt or a stereoisomer thereof.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/067946

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07D471/04 A61P35/00 A61P37/00 A61K31/437 C07D213/74
C07D311/04 C07D217/02 C07D217/04 C07D401/06 C07D401/12
C07D403/06 C07D487/04 C07D495/04 C07D209/44 C07D211/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07D A61P A61K C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2011/082400 A2 (HARVARD COLLEGE [US]; SHARPE ARLENE H [US]; BUTTE MANISH J [US]; OYAMA) 7 July 2011 (2011-07-07) claims 1-95 page 1, lines 31-32 examples	1-47
A	TRYFON ZARGANES-TZITZIKAS ET AL: "Inhibitors of programmed cell death 1 (PD-1): a patent review (2010-2015)", EXPERT OPINION ON THERAPEUTIC PATENTS, vol. 26, no. 9, 19 September 2016 (2016-09-19), pages 973-977, XP055394015, ISSN: 1354-3776, DOI: 10.1080/13543776.2016.1206527 the whole document	1-47

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 May 2018	22/05/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marzi, Elena

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/067946

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2015/034820 A1 (SQUIBB BRISTOL MYERS CO [US]) 12 March 2015 (2015-03-12) claims 1-12 page 1, lines 6-11	1-47

A,P	WO 2017/112730 A1 (INCYTE CORP [US]) 29 June 2017 (2017-06-29) claims 1-32 examples	1-47

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/067946

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011082400 A2	07-07-2011	US 2013022629 A1	24-01-2013
		WO 2011082400 A2	07-07-2011
WO 2015034820 A1	12-03-2015	AU 2014315457 A1	28-04-2016
		CA 2923184 A1	12-03-2015
		CN 105705489 A	22-06-2016
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		EP 3041822 A1	13-07-2016
		ES 2642074 T3	15-11-2017
		HK 1223366 A1	28-07-2017
		JP 2016536333 A	24-11-2016
		KR 20160048946 A	04-05-2016
		PE 04322016 A1	11-05-2016
		SG 11201601225R A	30-03-2016
		US 2016194307 A1	07-07-2016
		WO 2015034820 A1	12-03-2015
WO 2017112730 A1	29-06-2017	TW 201726626 A	01-08-2017
		US 2017174679 A1	22-06-2017
		WO 2017112730 A1	29-06-2017