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23 July 2020 (23.07.2020)

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(54) Title: COMPOUNDS FOR TREATING CERTAIN LEUKEMIAS

(57) Abstract: Provided herein are compounds, preferably compounds inhibiting tyrosine kinase enzymatic activity of a protein selected from Abelson protein (ABL1), Abelson-related protein (ABL2), or a chimeric protein BCR-ABL1, compositions thereof, and methods of their preparation, and methods of inhibiting tyrosine kinase enzymatic activity of a protein selected from Abelson protein (ABL1), Abelson-related protein (ABL2), or a chimeric protein BCR-ABL1, and methods for treating diseases wherein modulation of BCR-ABL1 activity prevents, inhibits, or ameliorates the pathology and/or symptomology of the disease.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/051567

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61K 31/4184; C07D 235/08; A61K 31/4164; C07D 235/04 (2019.01)
CPC - A61K 31/4184; C07D 235/08; A61K 31/4164; C07D 235/04 (2019.08)

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/0197375 A1 (SIRCAR et al) 08 September 2005 (08.09.2005) entire document	1, 3, 4
A	US 2002/0010343 A1 (SIRCAR et al) 24 January 2002 (24.01.2002) entire document	1, 3, 4
A	US 2011/0046133 A1 (SUNG et al) 24 February 2011 (24.02.2011) entire document	1, 3, 4

☐ Further documents are listed in the continuation of Box C. ☐ 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
17 December 2019	15 JAN 2020

Name and mailing address of the ISA/US	Authorized officer
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/051567

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 6-17, 20-27
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet(s).

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1, 3, 4

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Continued from Box No. III Observations where unity of invention is lacking

Claims 1, 3, and 4 have been analyzed subject to the restriction that the claims read on a compound of formula (I), as shown, wherein L is –NH-CO-; R1 is unsubstituted C6 aryl; R2 is H; R3 is H; R4 is unsubstituted C1 alkyl; X is O; Y is CH; Z is CR5; R5 is H; R6 is H; and R7 is H.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I+: Claims 1-5, 18, and 19 are drawn to a compound of formula (I), as shown, or a tautomer thereof, or a pharmaceutically acceptable salt of any of the foregoing, and species thereof.

The first invention of Group I+ is restricted based on the proviso in the instant claim 1 that the compound is other than (i) 1H-Benzimidazole-7-carboxylic acid, 5-[[(4-methoxyphsenyl)sulfonyl]amino]- 1-methyl - or (ii) 1H-Benzimidazole-7-carboxylic acid, 5-[[(4-ethoxvphenyl)sulfonyl]amino]-1-methyl-; and is restricted to a compound of formula (I), as shown, wherein L is –NH-CO-; R1 is unsubstituted C6 aryl; R2 is H; R3 is H; R4 is unsubstituted C1 alkyl; X is O; Y is CH; Z is CR5; R5 is H; R6 is H; and R7 is H. It is believed that claims 1, 3, and 4 read on this first named invention and thus these claims will be searched without fee to the extent that they read on the above embodiment.

Applicant is invited to elect additional formula(e) to be searched in a specific combination by paying an additional fee for each set of election. An exemplary election would be a compound of formula (I), as shown, wherein L is –CO-NH-; R1 is unsubstituted C6 aryl; R2 is H; R3 is H; R4 is unsubstituted C1 alkyl; X is O; Y is CH; Z is CR5; R5 is H; R6 is H; and R7 is H. Applicants must specify the claims that read on any additional elected inventions. Applicants must further indicate, if applicable, the claims which read on the first named invention if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined.

The inventions listed in Groups I+ do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2 they lack the same or corresponding special technical features for the following reasons:

The Groups I+ compounds do not share a significant structural element requiring the selection of alternatives for the compound variables R1, R2, R3, R4, X, Y, L, and Z, and accordingly these groups lack unity a priori.

Additionally, even if Groups I+ were considered to share the technical features of a compound having the core structure of formula (I), as shown, or a tautomer thereof, or a pharmaceutically acceptable salt of any of the foregoing, these shared technical features do not represent a contribution over the prior art as disclosed by US 2005/0197375 A1 to Sircar et al.

Specifically, US 2005/0197375 A1 to Sircar et al. teaches a compound having the core structure of formula (I), as shown, (Pg. 42, compound B-4, as shown) or a tautomer thereof, or a pharmaceutically acceptable salt of any of the foregoing.

The inventions listed in Groups I+ therefore lack unity under Rule 13 because they do not share a same or corresponding special technical feature.