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DATABASE CA [Online] CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; MIKHAILITSYN, FELIKS S. ET AL: "N-(3-Nitro-4-chlorophenylsulfonyl)anthranilic acid as an intermediate for synthesis of N-(4-chlorophenyl)-2-[(3-nitro-4-chlorophenylsulfonyl)amino]-5-bromobenzamide, showing antitrichocephalasis activity", XP002735703, retrieved from STN Database accession no. 1993:516978 & SU 1 754 712 A1 (INST MED PARAZITOLOGII TROPIC [SU]) 15 August 1992 (1992-08-15)
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Description

[0001] The present invention relates to novel sulfonylaminobenzamide compounds and their use in the control of endoparasites, for example heartworms, in warm-blooded animals.

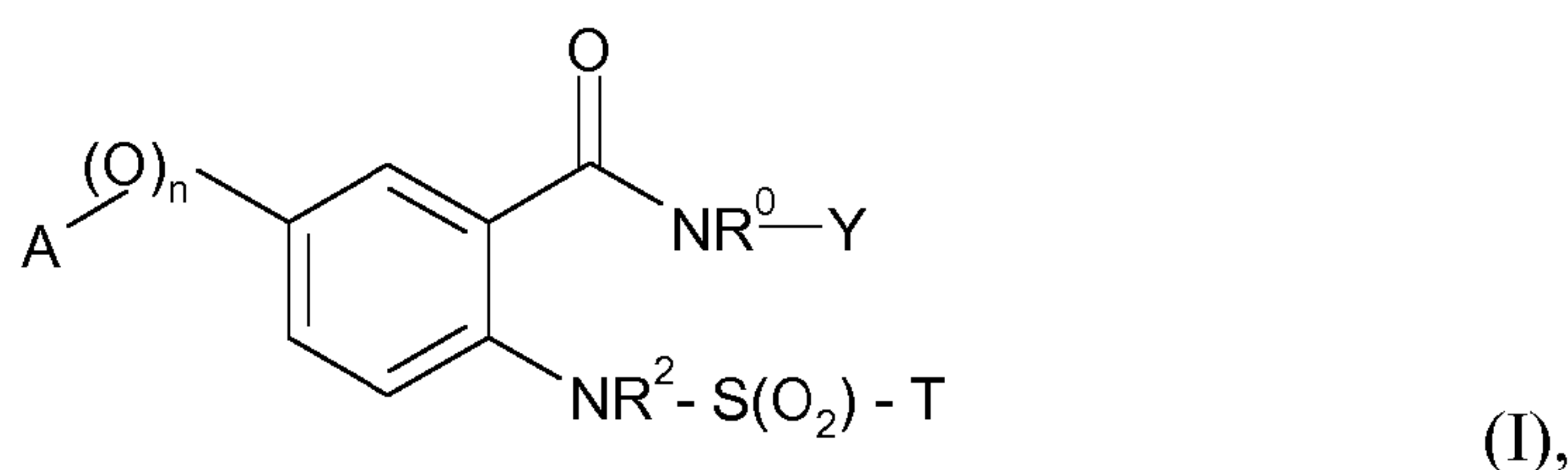
[0002] Heartworm (*Dirofilaria immitis*) is a parasitic roundworm that is spread from host to host through the bites of mosquitoes. The definite host is the dog but it can also infect cats and other warm-blooded animals. Although commonly being called "heartworm" the adult worms actually reside in the pulmonary arterial system (lung arteries) for the most part, and the primary effect on the health of the animal is damage to the lung vessels and tissue. Occasionally, adult heartworms migrate to the right heart and even the great veins in heavy infections. Heartworm infection may result in serious disease for the host.

[0003] Heartworm infections may be combatted with arsenic-based compounds; the treatment is time-consuming, cumbersome and often only partly successful. Accordingly, the main focus is on the prevention of heartworm infections. Heartworm prevention is currently performed exclusively by year round periodical administration of a macrocyclic lactone such as ivermectin, moxidectin or milbemycin oxime to the dog, cat or else warm-blooded animal. Unfortunately, upcoming resistancy of *Dirofilaria immitis* against macrocyclic lactones has been observed in certain parts of the USA. Accordingly, there is a strong need for finding new classes of compounds which are effectively controlling heartworm infections either by way of prophylaxis or by direct killing of the different stages of heartworms. It now has been found surprisingly that a group of novel sulfonylaminobenzamide compounds effectively controls endoparasites including heartworms effectively on warm-blooded animals.

[0004] DE 35 23 705 A1 describes use of anthranilic-acid derivatives as anthelmintic medicaments. EP 0 420 804 A2 describes substituted anthranilic acid derivatives having anthelmintic activity. EP 0 420 805 A2 describes substituted anthranilic acid derivatives having anthelmintic activity.

SUMMARY OF THE INVENTION

[0005] The present invention therefore according to one embodiment concerns a compound of formula



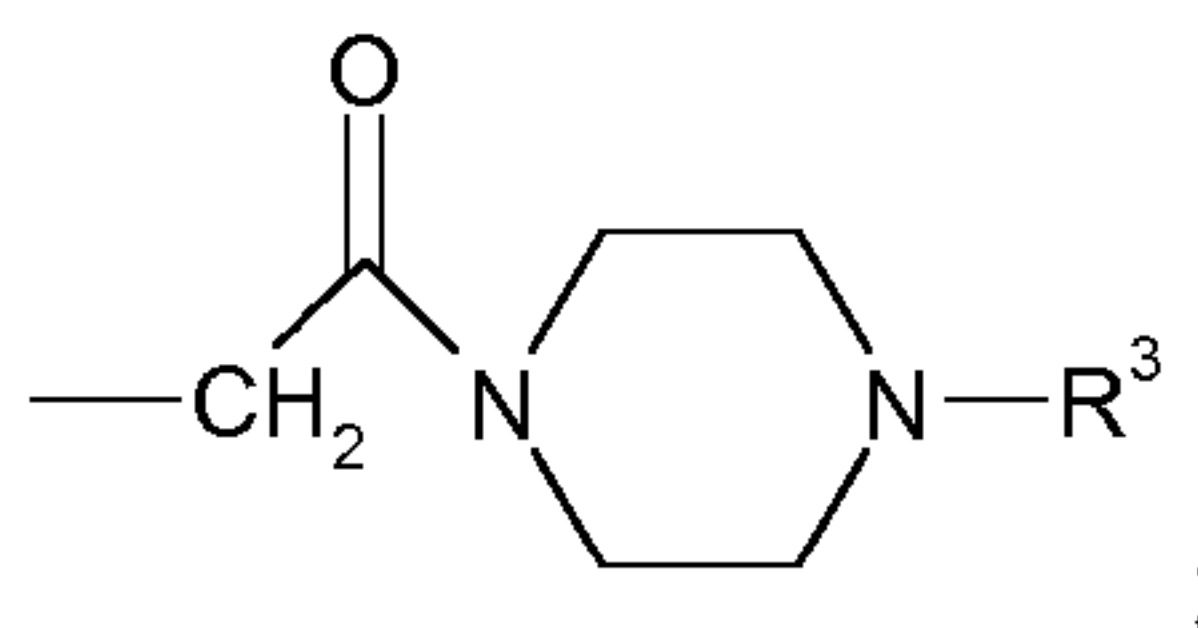
or a salt or an enantiomer thereof, wherein

n is 1;

A is a phenyl radical substituted by chlorine, fluorine, or CF_3 ;

R^2 is H or $-\text{S}(\text{O}_2)-\text{T}$;

T is C_1-C_6 -alkyl, which is unsubstituted or substituted by halogen, trimethylsilyl, C_3-C_6 -cycloalkyl, carboxyl or C_1-C_4 -alkoxycarbonyl; C_3-C_6 -cycloalkyl; C_6-C_{12} -bicyclobutyl; phenyl which is unsubstituted or substituted by halogen, cyano, nitro, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl or C_1-C_4 -alkoxy; a 5- or 6 membered heteroaromatic radical, which is further unsubstituted or substituted by halogen, cyano, nitro, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl or C_1-C_4 -alkoxy; 5- or 6-membered heterocycloalkyl having from 1 to 3 same or different heteroatoms selected from the group consisting of N, O, S and $\text{S}(\text{O}_2)$, which is further unsubstituted or substituted by C_1-C_4 -alkyl, C_1-C_2 -alkoxycarbonyl or benzyloxycarbonyl; a group



amino; or N-mono- or N,N-di- C_1-C_4 -alkylamino;

R^3 is C_1-C_4 -alkyl, unsubstituted or halogen-, C_1-C_4 -alkyl- or C_1-C_4 -haloalkyl-substituted phenyl, unsubstituted or halogen-, C_1-C_4 -alkyl- or C_1-C_4 -haloalkyl-substituted pyridyl, C_1-C_4 -alkoxycarbonylmethyl or morpholin-4-yl-carb-

onylmethyl;
 R^0 is H or hydroxy; and
 Y is

- 5 (i) phenyl or a phenylamino, which is substituted by one or more same or different radicals selected from the group consisting of halogen; C_1 - C_2 -alkyl; C_1 - C_3 -haloalkyl; C_1 - C_2 -alkoxy; C_1 - C_3 -haloalkoxy; C_1 - C_2 -haloalkylthio; SF_5 ; cyano; nitro; hydroxy; or methylsulfonylamino; or is
- 10 (ii) 5- or 6 membered heteroaryl or heteroarylamino, which is each further unsubstituted or substituted by halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy, C_1 - C_4 -alkoxycarbonyl, C_2 - C_4 -alkanoyl, or phenyl or phenylsulfonyl which is each unsubstituted or substituted by halogen, cyano, nitro methyl or methoxy; or is
- 15 (iii) benzoyl or 5- or 6 membered heteroarylcarbonyl, which is each further unsubstituted or substituted by halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy, C_1 - C_4 -alkoxycarbonyl, C_2 - C_4 -alkanoyl or phenyl; or is
- (iv) a C_6 - C_{12} -bicarbo-cyclic radical; or is a
- (v) a hetero-bicyclic ring radical comprising a total of 8 to 10 ring members, from which 1 to 5, preferably 1 or 2, members are same or different heteroatoms selected from the group consisting of B, N, O and S, and from which 0 to 2 members are a group -C(O)-, which bicyclic ring radical is further unsubstituted or substituted by halogen, cyano, hydroxyl, C_1 - C_4 -alkoxy, C_1 - C_4 -alkyl or C_1 - C_4 -haloalkyl; or is
- 20 (vi) a radical $-H_2C-C(O)-NH-R^4$, wherein R^4 is C_1 - C_4 -haloalkyl, C_2 - C_3 -alkynyl or cyano- C_1 - C_4 -alkyl; or

R^0 and Y together with the N-atom to which they are attached, form a piperidinyl or piperazinyl radical which is substituted by C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy, unsubstituted or halogen-, C_1 - C_4 -alkyl-, C_1 - C_4 -haloalkyl-, amino- and/or C_1 - C_4 -alkoxy-substituted phenyl or benzoylamino, or unsubstituted or C_1 - C_4 -alkyl-, C_1 - C_4 -haloalkyl-, C_3 - C_6 -cycloalkyl- or halogen-substituted pyridyl or pyrimidinyl;

25 subject to the proviso that
 at least one of A and Y must not be a phenyl radical if T is CH_3 .

30 **[0006]** The invention also provides a composition comprising a compound of formula (I), or a salt or enantiomer thereof, and at least one carrier, for example a surfactant, a solid diluent and/or a liquid diluent.

[0007] In one embodiment, this invention also provides a composition for controlling parasites, in particular endoparasites, comprising a biologically effective amount of a compound of formula (I), or a salt thereof, and at least one additional component selected from the group consisting of a surfactant, a solid diluent and a liquid diluent, said composition optionally further comprising a biologically effective amount of at least one additional pharmaceutically or veterinary active compound or agent.

35

[0008] This disclosure also provides a method for controlling parasites comprising contacting the parasites or their environment with a pharmaceutically or veterinary effective amount of a compound of formula (I), an enantiomer or a salt thereof, (e.g. as a composition disclosed herein).

40 **[0009]** This disclosure also provides use of compositions for controlling parasites comprising contacting the parasites or their environment with a pharmaceutically or veterinary effective amount of a compound of formula (I), an enantiomer or a salt thereof, (e.g., as a composition described herein). This disclosure also relates to such uses wherein the parasites or their environment are contacted with a composition comprising a pharmaceutically or veterinary effective amount of a compound of formula (I), an enantiomer or a salt thereof, and at least one additional component selected from the group consisting of a surfactant, a solid diluent and a liquid diluent, said composition optionally further comprising a pharmaceutically or veterinary effective amount of at least one additional pharmaceutically or veterinary active compound or agent.

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[0010] This disclosure also provides use of a compound for protecting an animal from a parasitic pest comprising administering to the animal a parasitically effective amount of a compound of formula (I), an enantiomer or a salt thereof.

50 DETAILS OF THE INVENTION

[0011] In the above recitations, the term "alkyl", used either alone or in compound words such as "alkylthio", "haloalkylthio", "haloalkyl", "N-alkylamino", "N,N-di-alkylamino" and the like includes straight-chain or branched alkyl, such as, methyl, ethyl, n-propyl, i-propyl, n-, iso-, sec.- or tert.-butyl or the different pentyl or hexyl isomers.

55 **[0012]** The term "alkoxy" used either alone or in compound words such as "haloalkoxy", "alkoxycarbonyl" includes, for example, methoxy, ethoxy, n-propyloxy, isopropyloxy and the different butoxy, pentoxy and hexyloxy isomers. "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio, pentylthio and hexylthio isomers.

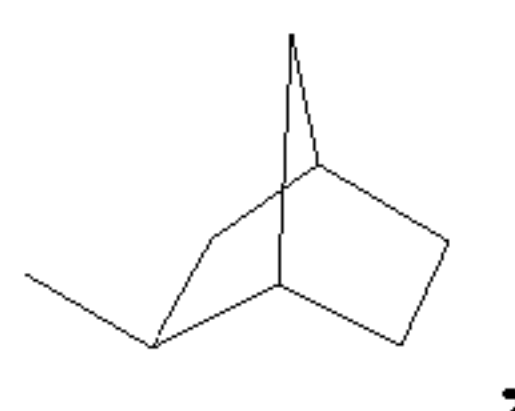
[0013] "Alkylsulfinyl" includes both enantiomers of an alkylsulfinyl group. Examples of "alkylsulfinyl" include $\text{CH}_3\text{S(O)-}$, $\text{CH}_3\text{CH}_2\text{S(O)-}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{S(O)-}$, $(\text{CH}_3)_2\text{CHS(O)-}$ and the different butylsulfinyl, pentylsulfinyl and hexylsulfinyl isomers.

[0014] "Alkylcarbonyl" denotes a straight-chain or branched alkyl moieties bonded to a C(=O) moiety. Examples of "alkylcarbonyl" include $\text{CH}_3\text{C(=O)-}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{C(=O)-}$ and $(\text{CH}_3)_2\text{CHC(=O)-}$. Examples of "alkoxycarbonyl" include $\text{CH}_3\text{OC(=O)-}$, $\text{CH}_3\text{CH}_2\text{OC(=O)-}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OC(=O)-}$, $(\text{CH}_3)_2\text{CHOC(=O)-}$ and the different butoxy- or pentoxycarbonyl isomers, for example tert.-butoxycarbonyl (Boc). Examples of "alkoxycarbonylamino" include tert.-butoxycarbonylamino, examples of "N-alkoxycarbonyl" include N-tert.-butoxycarbonyl and examples of "N-alkylamino" include N-methylamino. Examples of "N-mono- or N,N-di-alkylaminocarbonyl" include N-methylaminocarbonyl, N-ethylaminocarbonyl, N-methyl-N-ethylaminocarbonyl, N,N-di-methylaminocarbonyl or N,N-di-ethylaminocarbonyl. Examples of "alkylcarbonylamino" include methylcarbonylamino or ethylcarbonylamino.

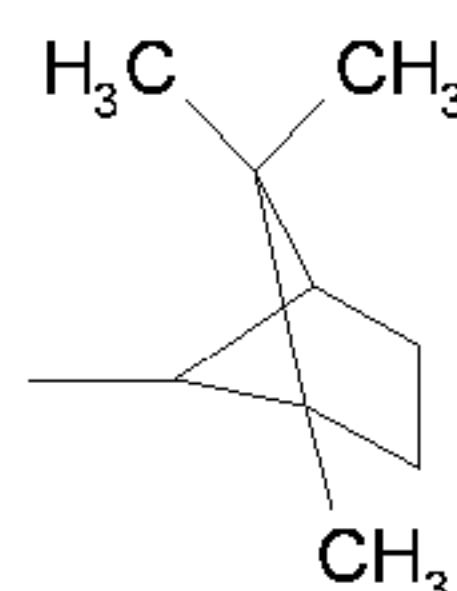
[0015] Examples of "alkylsulfonyl" include $\text{CH}_3\text{S(O)}_2\text{-}$, $\text{CH}_3\text{CH}_2\text{S(O)}_2\text{-}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{S(O)}_2\text{-}$, $(\text{CH}_3)_2\text{CHS(O)}_2\text{-}$, and the different butylsulfonyl, pentylsulfonyl and hexylsulfonyl isomers. Examples of "N-mono- or N,N-di-alkylaminosulfonyl" include N-methylaminosulfonyl, N-ethylaminosulfonyl, N-methyl-N-ethylaminosulfonyl, N,N-di-methylaminosulfonyl or N,N-di-ethylaminosulfonyl. Examples of "alkylsulfonylamino" include methylsulfonylamino or ethylsulfonylamino.

[0016] "Cycloalkyl" includes, for example, cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl. The term "alkylcycloalkyl" denotes alkyl substitution on a cycloalkyl moiety and includes, for example, ethylcyclopropyl, i-propylcyclobutyl, 3-methylcyclopentyl and 4-methylcyclohexyl.

[0017] Examples of $\text{C}_6\text{-C}_{12}$ -bicarbo-cyclyl are the radical of (+)- or (-)-campher (1,7,7-trimethylbicyclo[2.2.1]heptan-2-one), a radical



a radical



or indanyl.

[0018] The term "halogen", either alone or in compound words such as "haloalkyl", includes fluorine, chlorine, bromine or iodine. Further, when used in compound words such as "haloalkyl", said alkyl may be partially or fully substituted with halogen atoms which may be the same or different. Examples of "haloalkyl" include $\text{F}_3\text{C-}$, $\text{ClCH}_2\text{-}$, $\text{CF}_3\text{CH}_2\text{-}$ and $\text{CF}_3\text{CCl}_2\text{-}$. The terms "halocycloalkyl", "haloalkoxy", "haloalkylthio", and the like, are defined analogously to the term "haloalkyl". Examples of "haloalkoxy" include $\text{CF}_3\text{O-}$, $\text{CF}_3\text{CF}_2\text{-O-}$, $\text{CF}_3\text{CH}_2\text{O-}$, $\text{CCl}_3\text{CH}_2\text{O-}$, $\text{CF}_3\text{CHFCF}_2\text{O-}$ and $\text{HCF}_2\text{CH}_2\text{CH}_2\text{O-}$. Examples of "haloalkylthio" include $\text{CCl}_3\text{S-}$, $\text{CF}_3\text{S-}$, $\text{CCl}_3\text{CH}_2\text{S-}$ and $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{S-}$. Examples of "haloalkylsulfinyl" include $\text{CF}_3\text{S(O)-}$, $\text{CCl}_3\text{S(O)-}$, $\text{CF}_3\text{CH}_2\text{S(O)-}$ and $\text{CF}_3\text{CF}_2\text{S(O)-}$. Examples of "haloalkylsulfonyl" include $\text{CF}_3\text{S(O)}_2\text{-}$, $\text{CCl}_3\text{S(O)}_2\text{-}$, $\text{CF}_3\text{CH}_2\text{S(O)}_2\text{-}$ and $\text{CF}_3\text{CF}_2\text{S(O)}_2\text{-}$.

[0019] The total number of carbon atoms in a substituent group is indicated by the " $\text{C}_i\text{-C}_j$ " prefix where i and j are integers. For example, $\text{C}_1\text{-C}_4$ alkylsulfonyl designates methyl sulfonyl through butyl sulfonyl.

[0020] When a compound is substituted with a substituent bearing a subscript that indicates the number of said substituents can exceed 1, said substituents (when they exceed 1) are independently selected from the group of defined substituents, e.g., $(\text{R}_2)_n$, n is 1 or 2.

[0021] "Aromatic" indicates that each of the ring atoms is essentially in the same plane and has ap-orbital perpendicular to the ring plane, and in which $(4n + 2)$ π electrons, where n is a positive integer, are associated with the ring to comply with Hückel's rule.

[0022] The terms "heterocyclyl", "heterocyclic ring" or "heterocycle" denote a ring in which at least one atom forming the ring backbone is not carbon, e.g., nitrogen, oxygen sulfur or a group S(O) or S(O)_2 . Typically a heterocyclic ring contains no more than 4 nitrogens, no more than 2 oxygens and no more than 2 sulfurs. In addition, the heterocyclic ring may contain a group -C(O)- , -S(O)- or $\text{-S(O)}_2\text{-}$. Unless otherwise indicated, a heterocyclic ring can be a saturated, partially unsaturated, or fully unsaturated ring. When a fully unsaturated heterocyclic ring satisfies Hückel's rule, then said ring is also called a "heteroaromatic ring" or "heteroaryl" substituent. Unless otherwise indicated, heterocyclic rings and ring systems can be attached through any available carbon or nitrogen by replacement of a hydrogen on said carbon or nitrogen.

[0023] The term heterocyclyl, either alone or in compound words such as heterocyclyloxy may be, for example a 5- or 6-membered heterocyclic radical having from 1 to 4, preferably from 1 to 3 same or different heteroatoms selected from the group consisting of B, N, O and S, which is further unsubstituted or substituted. Examples of suitable substituents of the heterocyclyl are halogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₃-C₆-cycloalkyl, C₃-C₆-halocycloalkyl, hydroxy, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio, C₁-C₆-alkylsulfinyl, C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, cyano, nitro, amino, N-mono- or N,N-di-C₁-C₄-alkylamino, C₁-C₆-alkoxy-carbonyl, sulfonamido, N-mono- or N,N, di-C₁-C₄-alkylsulfonamido, C₁-C₆-alkylcarbonylamino, N-mono- or N,N-di-C₁-C₆-alkylaminocarbonyl, C₂-C₆-alkanoyl, or phenyl, which is unsubstituted or substituted by halogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, cyano or nitro.

[0024] The term heterocyclyl may denote, for example, a 5- or 6-membered heteroaryl radical having from 1 to 4, preferably from 1 to 3 same or different heteroatoms selected from the group consisting of N, O and S, which is further unsubstituted or substituted by one or more substituents as defined above for heterocyclyl. The heteroaryl radical is preferably substituted by 0 to 3, in particular 0, 1 or 2 substituents from the group as defined above.

[0025] The term 5- or 6-membered heteroaryl, either alone or in terms such as heteroarylamino or heteroarylcarbonyl, may include, for example, a thienyl, pyrrol, pyrazolyl, furyl, oxazolyl, thiazolyl, isothiazolyl, thiadiazolyl, pyridyl, pyrimidinyl or thiazinyl radical which is each unsubstituted or substituted, for example, by halogen, cyano, nitro, C₁-C₂-alkyl, C₁-C₂-haloalkyl, C₃-C₆-cycloalkyl, C₁-C₄-alkoxy, C₂-C₄-alkanoyl, C₁-C₄-alkoxycarbonyl or unsubstituted or substituted phenyl.

[0026] The term heterocyclyl may further denote a 3 to 6-membered heterocycloalkyl radical having from 1 to 3 same or different heteroatoms selected from the group consisting of B, N, O and S, which is further unsubstituted or substituted by one or more substituents as defined above for heterocyclyl. The heterocycloalkylene radical is preferably substituted by 0 to 3, in particular 0, 1 or 2 substituents from the group as defined above. Examples are tetrahydrofuranyl, pyrrolidinyl, morpholinyl, piperidinyl, piperazinyl or dioxaborolanyl which is each unsubstituted or substituted by halogen, C₁-C₂-alkyl, C₁-C₂-haloalkyl or C₁-C₂-alkoxy.

[0027] Examples of heterocyclyloxy are 2-, 3- or 4-pyridyloxy or pyrimidin-4-yloxy, which is each unsubstituted or substituted by halogen, C₁-C₂-alkyl, C₃-C₆-cycloalkyl, C₁-C₂-haloalkyl or C₁-C₂-alkoxy.

[0028] Examples of heterobicyclic ring radicals are benzoxazolyl, benzothiazolyl, tetrahydro-benzothiazolyl, indolyl, benzimidazolyl, benzopyrazolyl, 5,6-dihydro-4H-cyclopenta[b]thiophen-2-yl, methylenedioxycyclohexenyl, benzooxaboronyl, chinolinyl, triazolopyrimidinonyl, for example 1,2,3-triazolo[4,5-d]pyrimidin-7-one-5-yl, or phthalhydrazidyl, which may each be unsubstituted or substituted, for example, by halogen, cyano, C₁-C₄-alkyl, C₁-C₂-haloalkyl, hydroxy or C₁-C₂-alkoxy.

[0029] Concerning the variables contained in the compounds of formula (I), the following meanings and preferences apply.

[0030] The variable n is 1 and A is a phenyl radical substituted by chlorine, fluorine, or CF₃

[0031] The variable R² is preferably H.

[0032] T as alkyl radical is preferably C₁-C₄-alkyl, which is unsubstituted or substituted by halogen, cyclopropyl, cyclohexyl, trimethylsilyl, carboxy or C₁-C₂-alkoxycarbonyl. Particularly preferred meanings of T as alkyl radical are C₁-C₄-alkyl; C₁-C₃-haloalkyl, in particular CF₃, -CH₂-CF₃ or -CH₂-CH₂-CF₃; trimethylsilyl-C₁-C₂-alkyl; C₁-C₂-alkoxycarbonylmethyl; carboxymethyl; or cyclohexylmethyl; especially methyl.

[0033] T as C₃-C₆-cycloalkyl, in preferably cyclopropyl or cyclohexyl.

[0034] T as bicarbocyclyl is, for example, a bicycloalkylene or bicycloalkylenone radical, for example 1,7,7-trimethylbicyclo[2.2.1]heptyl or 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one-yl ((+)- or (-)-camphor).

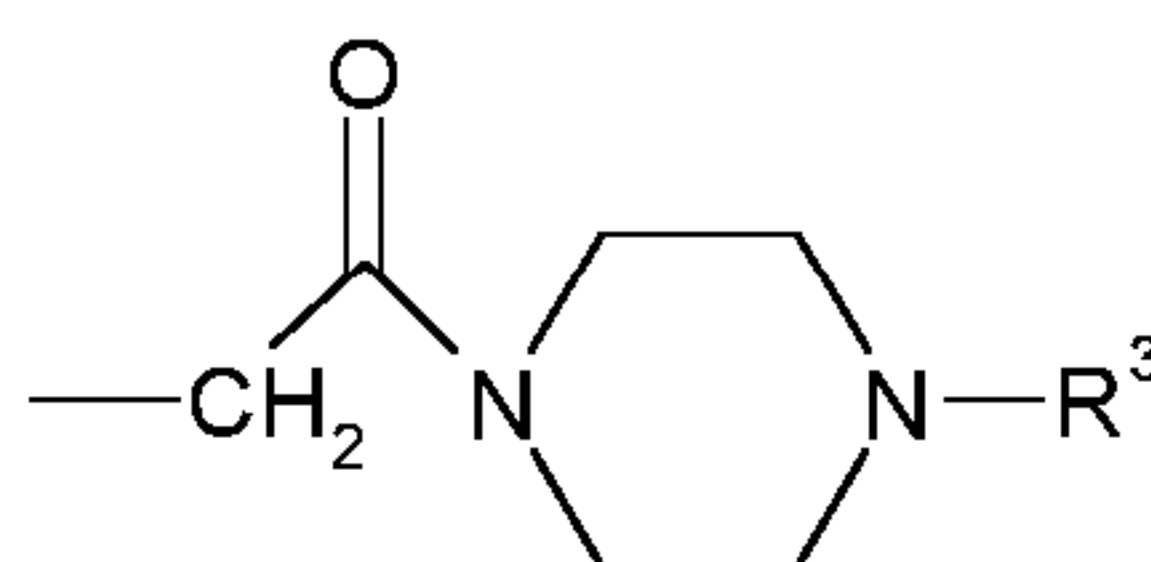
[0035] T as phenyl radical is preferably phenyl which is unsubstituted or substituted by fluorine, chlorine, methyl, methoxy, CF₃ or nitro.

[0036] T as heteroaromatic radical is preferably pyridyl, thienyl or pyrimidinyl.

[0037] T as heterocycloalkyl is preferably piperidinyl, piperazinyl, tetrahydropyranyl, morpholinyl, thiomorpholinyl or thiomorpholin-4-yl-1,1-dioxide, which is each unsubstituted or substituted by methyl or benzyloxycarbonyl. Particularly preferred heterocyclyl radicals T are 1-methylpiperazin-4-yl, 1-(benzyloxycarbonyl)-piperazin-4-yl, tetrahydro-2H-pyran-4-yl or, thiomorpholin-4-yl-1,1-dioxide.

[0038] R³ is preferably methyl, halophenyl, trifluoromethylpyridyl, tert.-butoxycarbonylmethyl or morpholin-4-yloxycarbonylmethyl.

[0039] T is preferably C₁-C₄-alkyl; C₁-C₃-haloalkyl; trimethylsilyl-C₁-C₂-alkyl; C₁-C₂-alkoxycarbonylmethyl; carboxymethyl; cyclohexylmethyl; C₃-C₆-cycloalkyl; 1,7,7-trimethylbicyclo[2.2.1]heptyl or 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one-yl ((+)- or (-)-camphor); phenyl which is unsubstituted or substituted by fluorine, chlorine, methyl, methoxy, CF₃ or nitro; pyridyl, thienyl or pyrimidinyl; heterocycloalkyl selected from piperidinyl, piperazinyl, tetrahydropyranyl, morpholinyl, thiomorpholinyl or thiomorpholin-4-yl-1,1-dioxide, which is each unsubstituted or substituted by methyl or benzyloxycarbonyl; or a group



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wherein R³ is methyl, halophenyl, trifluoromethylpyridyl, tert.-butoxycarbonylmethyl or morpholin-4-yloxy carbonylmethyl.

[0040] R⁰ is preferably H.

10 **[0041]** Preferred substituents of the phenyl or phenylamino radical Y are halogen; C₁-C₂-alkyl; C₁-C₃-haloalkyl; C₁-C₂-alkoxy; C₁-C₃-haloalkoxy; C₁-C₂-haloalkylthio; SF₅; cyano; nitro; hydroxy; or methylsulfonylamino.

[0042] Particularly preferred substituents of the phenyl or phenylamino radical Y halogen, methyl, C₁-C₃-haloalkyl, methoxy, C₁-C₃-haloalkoxy, SCF₃, SF₅, cyano, nitro or hydroxy and especially halogen or CF₃.

[0043] A specific preferred phenyl radical Y is 3,4,5-trichlorophenyl, 3,5-ditrifluoromethyl-4-chlorophenyl and 3,5-ditrifluoromethylphenyl.

15 **[0044]** A specific preferred phenylamino radical Y is phenyl amino which is substituted by chlorine, bromine, methyl trifluoromethyl, methoxy, cyano or nitro.

[0045] A heteroaryl radical Y is, for example, pyrrolyl, pyrazolyl, oxazolyl, thienyl, thiazolyl, isothiazolyl, thiadiazolyl, pyridyl or pyrimidinyl, which is each unsubstituted or substituted by halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₂-haloalkyl, C₁-C₂-alkoxy, C₁-C₂-alkoxycarbonyl, or phenyl or phenylsulfonyl which is in turn each unsubstituted or substituted by

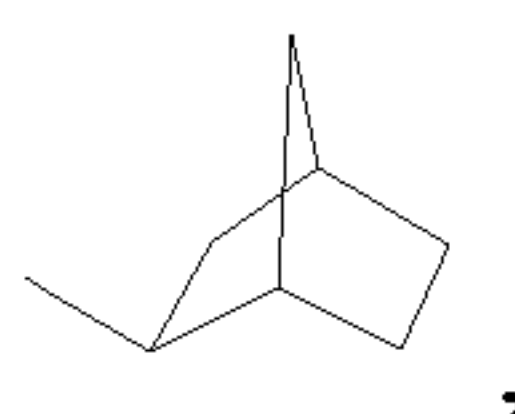
20 halogen, cyano, nitro methyl or methoxy.

[0046] A heteroaryl radical Y is preferably 2-, 3- or 4-pyridyl which is unsubstituted or substituted by halogen, C₁-C₄-alkyl or C₁-C₂-alkoxy; 2-thienyl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-alkoxycarbonyl; 2-thiazolyl, which is unsubstituted or substituted by halogen, cyano, nitro, C₁-C₂-alkyl, C₁-C₂-haloalkyl, C₁-C₂-alkoxycarbonyl, or phenyl or phenylsulfonyl which is in turn each unsubstituted or substituted by halogen, cyano, nitro or methyl; 5-isothiazoyl which is unsubstituted or substituted by halogen or methyl; 2-oxazolyl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-haloalkyl; or 1,3,4-thiadiazol-5-yl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-haloalkyl.

25 **[0047]** A heteroaryl amino radical Y is preferably 2-, 3- or 4-pyridylamino, which is unsubstituted or substituted by halogen, C₁-C₄-alkyl or C₁-C₂-alkoxy.

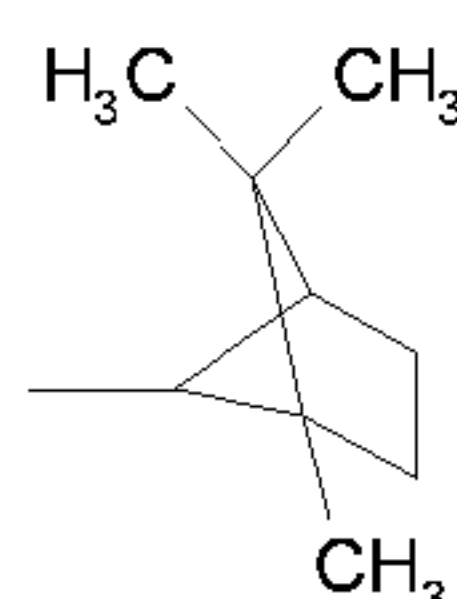
[0048] A benzoyl or heteroarylcarbonyl radical Y is preferably benzoyl, which is unsubstituted or substituted by halogen; or 2-, 3- or 4-pyridylcarbonyl which is unsubstituted or substituted by halogen or C₁-C₄-alkyl.

30 **[0049]** A preferred bicarbocyclic radical Y is preferably a radical



35

a radical



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or indanyl.

[0050] A preferred heterobicyclic ring radical Y is benzothiazolyl, indolyl, chinolinyl, methylenedioxophenyl, benzooxaboronyl, triazolopyrimidinonyl or phthalhydrazidyl, which is each be unsubstituted or substituted by halogen, C₁-C₄-alkyl, C₁-C₂-haloalkyl, C₁-C₄-alkoxy or hydroxy.

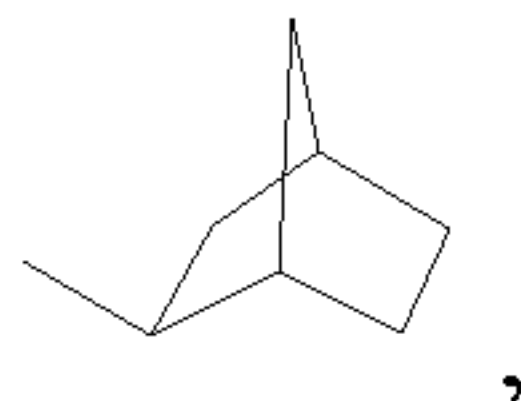
50 **[0051]** The variable R⁴ is preferably propynyl, 2,2,2-trifluoroethyl or cyanomethyl.

[0052] A preferred radical Y is thus (i) phenyl or phenylamino which is substituted by halogen, C₁-C₂-alkyl, C₁-C₃-haloalkyl, C₁-C₂-alkoxy, C₁-C₃-haloalkoxy, C₁-C₂-haloalkylthio, SF₅, cyano, nitro, hydroxy or methylsulfonylamino; (iia) heteroaryl selected from 2-, 3- or 4-pyridyl which is unsubstituted or substituted by halogen, C₁-C₄-alkyl or C₁-C₂-alkoxy, 2-thienyl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-alkoxycarbonyl, 2-thiazolyl, which is unsubstituted or substituted by halogen, cyano, nitro, C₁-C₂-alkyl, C₁-C₂-haloalkyl, C₁-C₂-alkoxycarbonyl, or phenyl or phenylsulfonyl which is in turn each unsubstituted or substituted by halogen, cyano, nitro or methyl, 5-isothiazoyl which is unsubstituted or substituted by halogen or methyl, 2-oxazolyl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-haloalkyl, or 1,3,4-thiadiazol-5-yl, which is unsubstituted or substituted by C₁-C₂-alkyl or C₁-C₂-haloalkyl; (iib)

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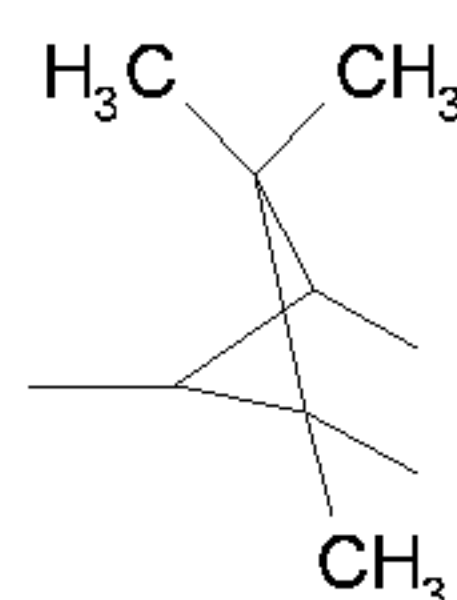
heteroaryl amino selected from 2-, 3- or 4-pyridyl amino, which is unsubstituted or substituted by halogen, C₁-C₄-alkyl or C₁-C₂-alkoxy; (iii) benzoyl, which is unsubstituted or substituted by halogen, or 2-, 3- or 4-pyridyl carbonyl which is unsubstituted or substituted by halogen or C₁-C₄-alkyl; (iv) a bicarbocyclic radical selected from a radical

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10 a radical

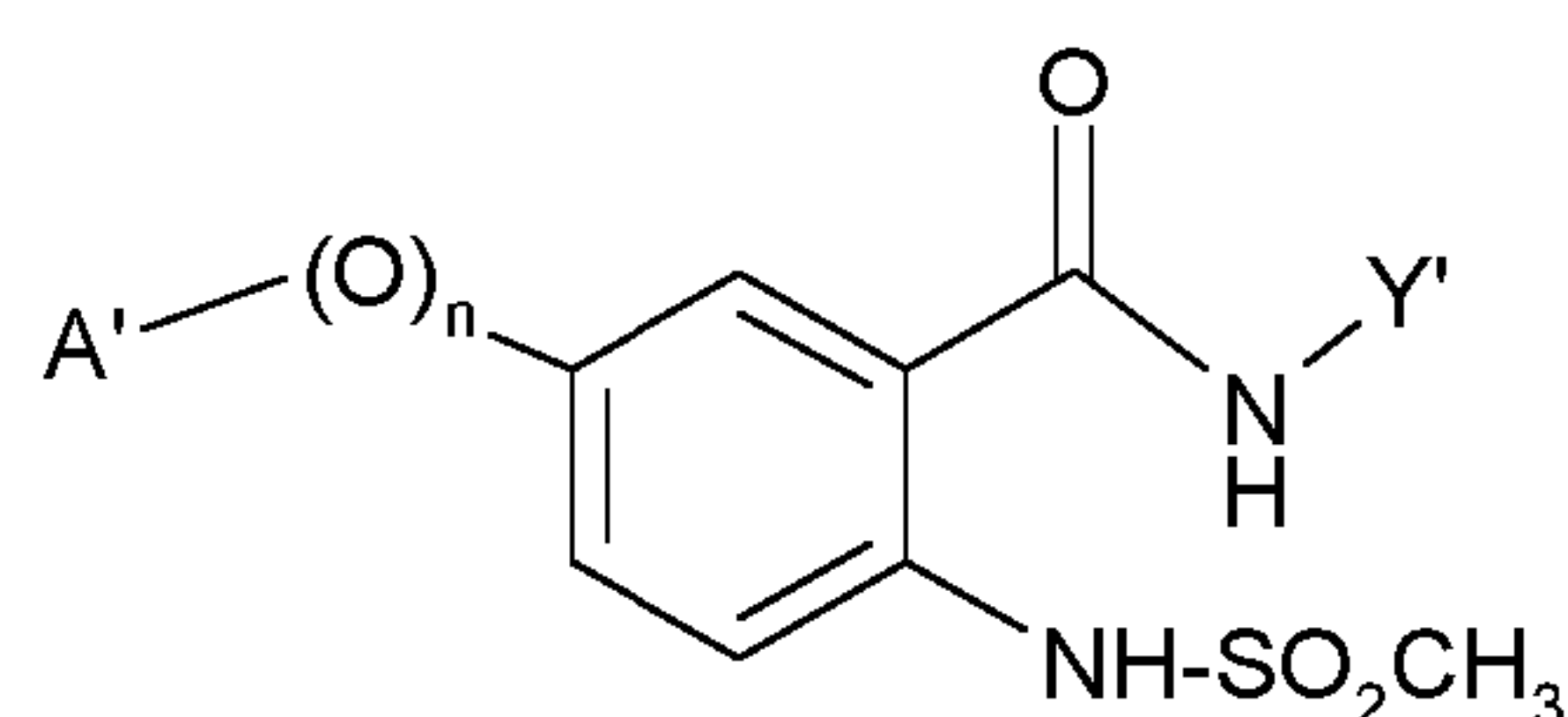
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and indanyl; (v) a heterobicyclic ring radical selected from benzothiazolyl, indolyl, chinolyl, methylenedioxyphenyl, benzooxaboronyl, triazolopyrimidinonyl and phthalhydrazidyl, which is each be unsubstituted or substituted by halogen, C₁-C₄-alkyl, C₁-C₂-haloalkyl, C₁-C₄-alkoxy or hydroxy; or (vi) a radical -H₂C-C(O)-NH-R⁴, wherein R⁴ is propynyl, 2,2,2-trifluoroethyl or cyanomethyl.

[0053] If R⁰ and Y together with the N-atom to which they are attached, form a piperidiny or piperazinyl radical, said piperidiny or piperazinyl radical is preferably substituted by methyl; methoxy; halogen-, amino-, methoxy- or trifluoromethyl-substituted phenyl or benzoylamino; or halogen-, trifluoromethyl- and/or cyclopropyl-substituted pyridyl or pyrimidinyl.

[0054] One embodiment of the present invention concerns a compound of formula

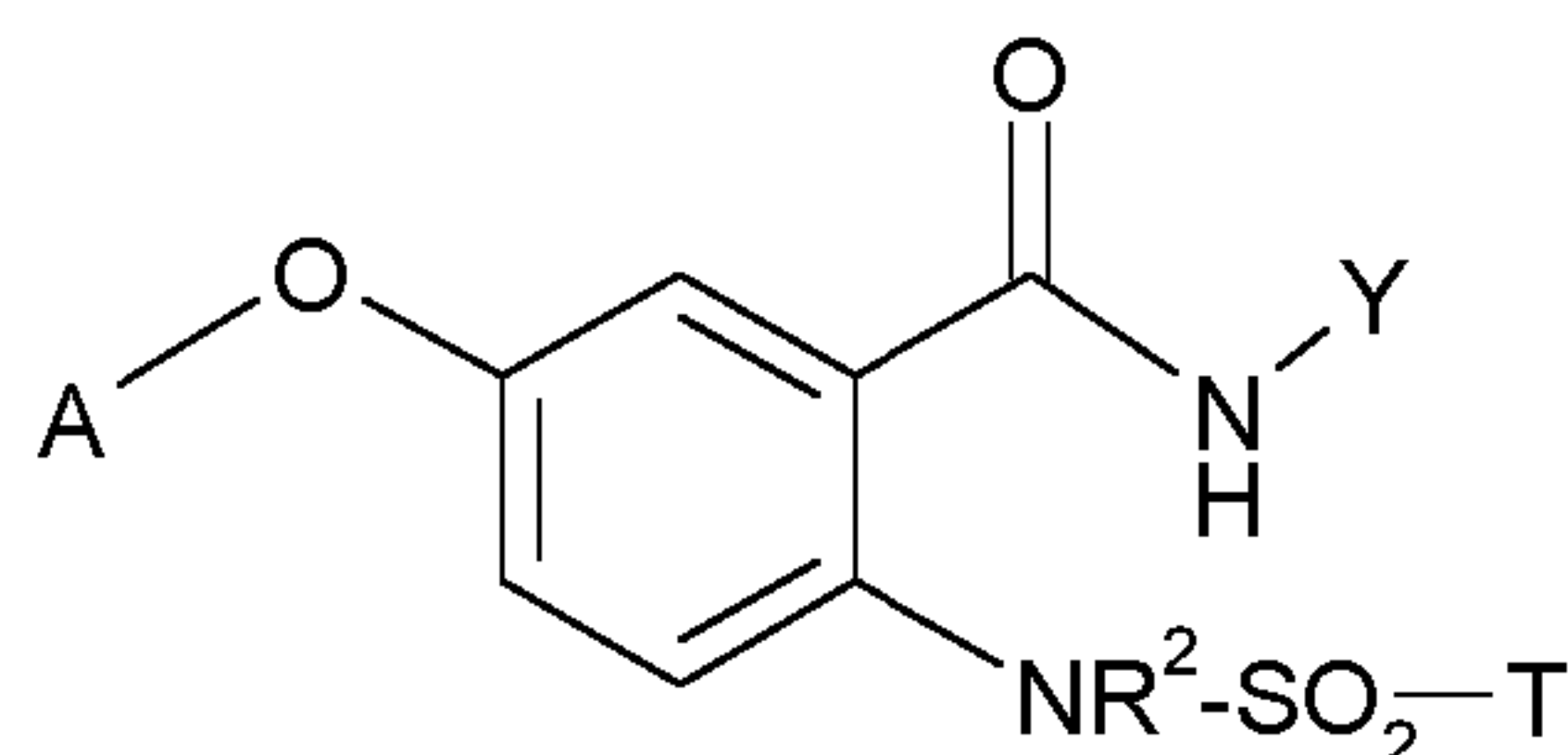


(Ia),

wherein n is 1, Y' is phenyl which is substituted as mentioned above including the preferences; and A' is a phenyl radical substituted by chlorine, fluorine or CF₃.

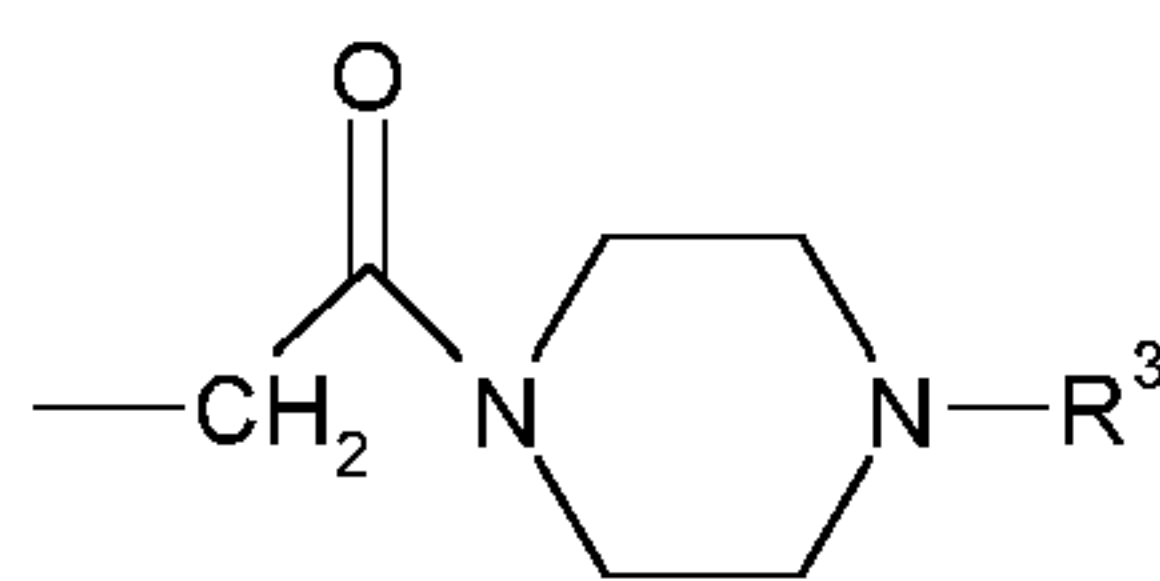
[0055] A compound of formula (Ia), wherein Y' is phenyl which is substituted by 2 or 3 same or different radicals selected from halogen or CF₃.

[0056] A further preferred embodiment of the present invention concerns a compound of formula



(Ib),

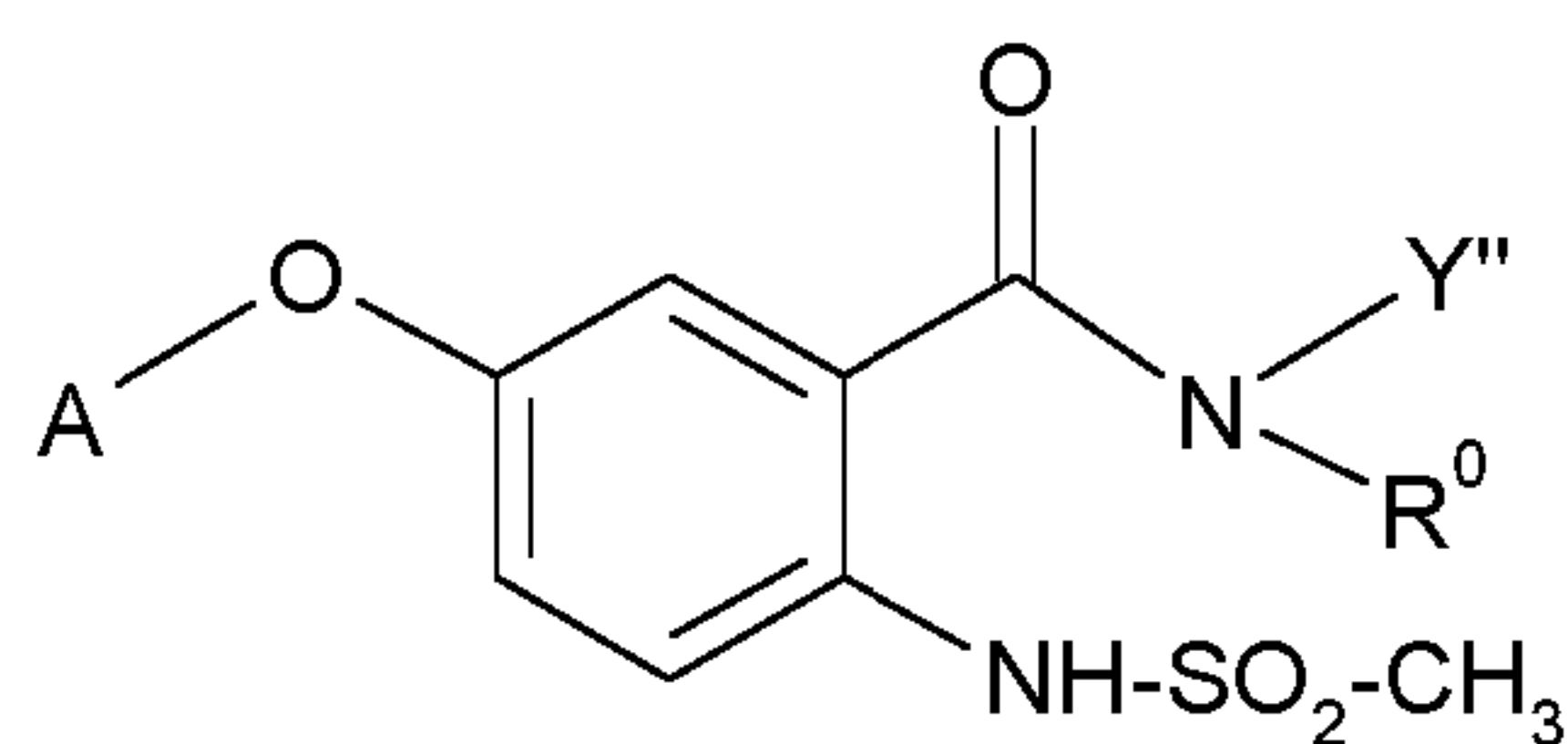
wherein A is phenyl which is unsubstituted or substituted as mentioned above including the preferences, Y is phenyl which is substituted as mentioned above including the preferences, T is C₂-C₆-alkyl, which is unsubstituted or substituted by halogen, trimethylsilyl, C₃-C₆-cycloalkyl, carboxy or C₁-C₄-alkoxycarbonyl; C₃-C₆-cycloalkyl; C₆-C₁₂-bicarbocyclyl; phenyl which is unsubstituted or substituted by halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxy; a 5- or 6 membered heteroaromatic radical, which is further unsubstituted or substituted by halogen, C₁-C₄-alkyl or C₁-C₄-alkoxy; amino; N-mono- or N,N-di- C₁-C₄-alkyl amino; 5- or 6-membered heterocycloalkyl having from 1 to 3 same or different heteroatoms selected from the group consisting of N, O, S and S(O₂), which is further unsubstituted or substituted by C₁-C₄-alkyl; or a group



and R^3 is C_1 - C_4 -alkyl, unsubstituted or halogen-, C_1 - C_4 -alkyl- or C_1 - C_4 -haloalkyl-substituted phenyl, unsubstituted or halogen-, C_1 - C_4 -alkyl- or C_1 - C_4 -haloalkyl-substituted pyridyl, C_1 - C_4 -alkoxycarbonylmethyl or morpholin-4-yl-carbonylmethyl.

[0057] A preferred embodiment relates to a compound of formula (Ib), wherein A is phenyl which is unsubstituted or preferably mono-substituted by chlorine, fluorine or CF_3 , Y is phenyl which is substituted by 2 or 3 same or different radicals selected from halogen or CF_3 , and T is C_2 - C_4 -alkyl, which is unsubstituted or substituted by halogen, cyclopropyl, cyclohexyl, trimethylsilyl, carboxy or C_1 - C_2 -alkoxycarbonyl; cyclopropyl or cyclohexyl; the radical of (+)- or (-)-camphor; phenyl which is unsubstituted or substituted by fluorine, chlorine, methyl, methoxy, CF_3 or nitro; or pyridyl, thienyl or pyrimidinyl; piperidinyl, piperazinyl, tetrahydropyranyl, morpholinyl, thiomorpholinyl or thiomorpholin-4-yl-1,1-dioxide, which is each unsubstituted or substituted by methyl or benzyloxycarbonyl.

[0058] A further preferred embodiment of the present invention concerns a compound of formula



(Ic),

wherein A is phenyl which is unsubstituted or substituted as mentioned above including the preferences, R^0 is H or hydroxyl; and Y'' is

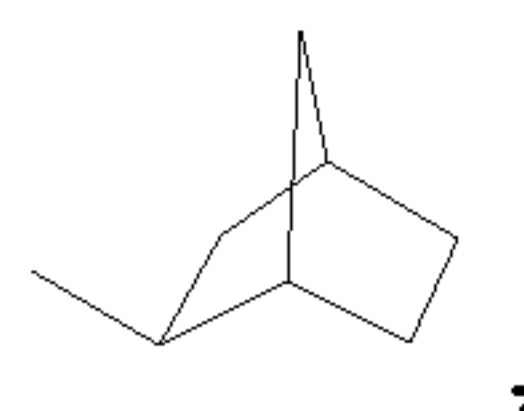
- (i) 5- or 6 membered heteroaryl or heteroarylamino, which is each further unsubstituted or substituted by halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy, C_1 - C_4 -alkoxycarbonyl, C_1 - C_4 -alkanoyl or phenyl or phenylsulfonyl which is each unsubstituted or substituted by halogen, cyano, nitro methyl or methoxy; or is
- (ii) benzoyl or 5- or 6 membered heteroarylcarbonyl, which is each further unsubstituted or substituted by halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy, C_1 - C_4 -alkoxycarbonyl, C_1 - C_4 -alkanoyl or phenyl; or is
- (iii) a C_6 - C_{12} -bicarbo-cyclic radical; or is a
- (iv) a hetero-bicyclic ring radical comprising a total of 8 to 10 ring members, from which 1 to 5, preferably 1 or 2, are same or different heteroatoms selected from the group consisting of B, N, O and S, and from which 0 to 2 are a group -C(O)-, which bicyclic ring radical is further unsubstituted or substituted by halogen, cyano, hydroxyl, C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy or C_1 - C_4 -haloalkyl; or is
- (v) a radical $-H_2C-C(O)-NH-R^4$, wherein R^4 is C_1 - C_4 -haloalkyl, C_2 - C_3 -alkynyl or cyano- C_1 - C_4 -alkyl; or R^0 and Y together with the N-atom to which they are attached, form a piperidinyl or piperazinyl radical which is substituted by C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy, unsubstituted or halogen-, C_1 - C_4 -alkyl-, halo- C_1 - C_4 -alkyl-, amino- and/or C_1 - C_4 -alkoxy-substituted phenyl or benzoylamino, or unsubstituted or C_1 - C_4 -alkyl-, C_1 - C_4 -haloalkyl-, C_3 - C_6 -cycloalkyl- or halogen-substituted pyridyl or pyrimidinyl.

[0059] Concerning a preferred embodiment of the compounds of formula (Ic), A is phenyl which is unsubstituted or preferably mono-substituted by chlorine, fluorine or CF_3 ; R^0 is H, and Y'' is

- (i) 2-, 3- or 4-pyridyl which is unsubstituted or substituted by halogen, C_1 - C_4 -alkyl or C_1 - C_2 -alkoxy; 2-thienyl, which is unsubstituted or substituted by C_1 - C_2 -alkyl, C_1 - C_2 -alkoxycarbonyl; 2-thiazolyl, which is unsubstituted or substituted by halogen, cyano, nitro, C_1 - C_2 -alkyl, C_1 - C_2 -haloalkyl, C_1 - C_2 -alkoxycarbonyl, or phenyl or phenylsulfonyl which is in turn each unsubstituted or substituted by halogen, cyano, nitro or methyl; 5-isothiazoyl which is unsubstituted or substituted by halogen or methyl; 2-oxazolyl, which is unsubstituted or substituted by C_1 - C_2 -alkyl or C_1 - C_2 -haloalkyl; or 1,3,4-thiadiazol-5-yl, which is unsubstituted or substituted by C_1 - C_2 -alkyl or C_1 - C_2 -haloalkyl; 2-, 3- or 4-pyridylamino, which is unsubstituted or substituted by halogen, C_1 - C_4 -alkyl or C_1 - C_2 -alkoxy; or
- (ii) benzoyl, which is unsubstituted or substituted by halogen or 2-, 3- or 4-pyridylcarbonyl which is unsubstituted or substituted by halogen or C_1 - C_4 -alkyl; or

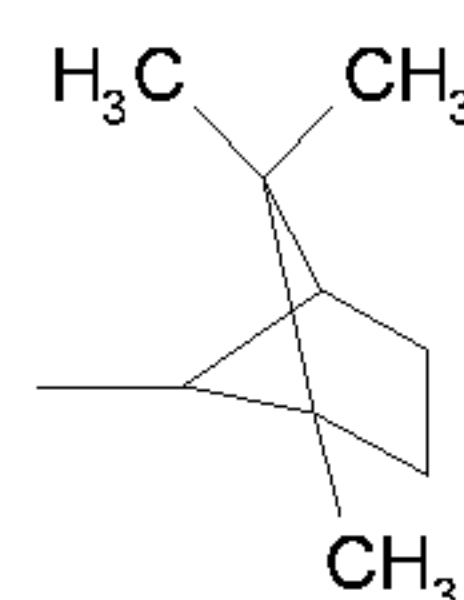
(iii) a radical

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a radical

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or indanyl; or

(iv) benzothiazolyl, indolyl, chinolinyl, methylenedioxophenyl, benzooxaboronyl, triazolopyrimidinonyl or phthalhydrazidyl, which is each be unsubstituted or substituted by halogen, C₁-C₄-alkyl, C₁-C₂-haloalkyl or hydroxy; or

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(v) a radical -H₂C-C(O)-NH-CH₂-C≡CH, -H₂C-C(O)-NH-CH₂-CN or -H₂C-C(O)-NH-CH₂-CF₃; or R⁰ and Y together with the N-atom to which they are attached, form a piperidinyl or piperazinyl radical, which is substituted by methyl; methoxy; halogen-, amino-, methoxy- or trifluoromethyl-substituted phenyl or benzoylamino; or halogen-, trifluoromethyl- and/or cyclopropyl-substituted pyridyl or pyrimidinyl.

25

[0060] A salt of a compound or formula (I) may be produced in known manner. Acid addition salts, for example, are obtainable by treatment with a suitable acid or a suitable ion exchange reagent, and salts with bases are obtainable by treatment with a suitable base or a suitable ion exchange reagent.

[0061] Salts of compounds of formula (I) can be converted into the free compounds by the usual means, acid addition salts e.g. by treating with a suitable basic composition or with a suitable ion exchange reagent, and salts with bases e.g. by treating with a suitable acid or a suitable ion exchange reagent.

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[0062] Salts of compounds of formula (I) can be converted into other salts of compounds of the formula (I) in a known manner; acid addition salts can be converted for example into other acid addition salts, e.g. by treating a salt of an inorganic acid, such as a hydrochloride, with a suitable metal salt, such as a sodium, barium, or silver salt, of an acid, e.g. with silver acetate, in a suitable solvent, in which a resulting inorganic salt, e.g. silver chloride, is insoluble and thus precipitates out from the reaction mixture.

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[0063] Depending on the method and/or reaction conditions, the compounds of formula (I) with salt-forming characteristics can be obtained in free form or in the form of salts. Compounds of formula (I) can also be obtained in the form of their hydrates and/or also can include other solvents, used for example where necessary for the crystallisation of compounds present in solid form.

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[0064] As mentioned before, the compounds of formula (I) may be optionally present as optical and/or geometric isomers or as a mixture thereof. The invention relates both to the pure isomers and to all possible isomeric mixtures, and is hereinbefore and hereinafter understood as doing so, even if stereochemical details are not specifically mentioned in every case.

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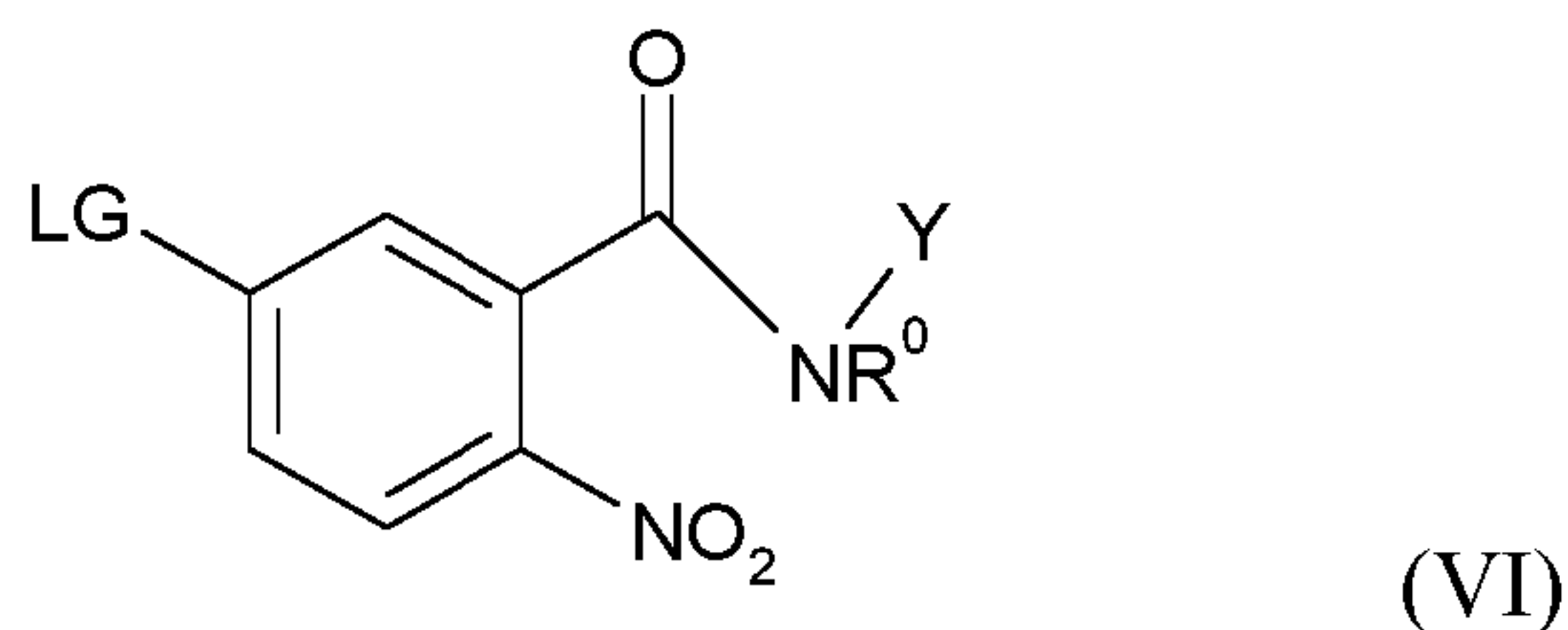
[0065] Diastereoisomeric mixtures of compounds of formula (I), which are obtainable by the process or in another way, may be separated in known manner, on the basis of the physical-chemical differences in their components, into the pure diastereoisomers, for example by fractional crystallisation, distillation and/or chromatography.

50

[0066] Splitting of mixtures of enantiomers, that are obtainable accordingly, into the pure isomers, may be achieved by known methods, for example by recrystallisation from an optically active solvent, by chromatography on chiral adsorbents, e.g. high-pressure liquid chromatography (HPLC) on acetyl cellulose, with the assistance of appropriate microorganisms, by cleavage with specific immobilised enzymes, through the formation of inclusion compounds, e.g. using chiral crown ethers, whereby only one enantiomer is complexed.

[0067] The compounds of the formula (I), wherein n is 1, may be prepared, for example, by reaction of a compound of formula

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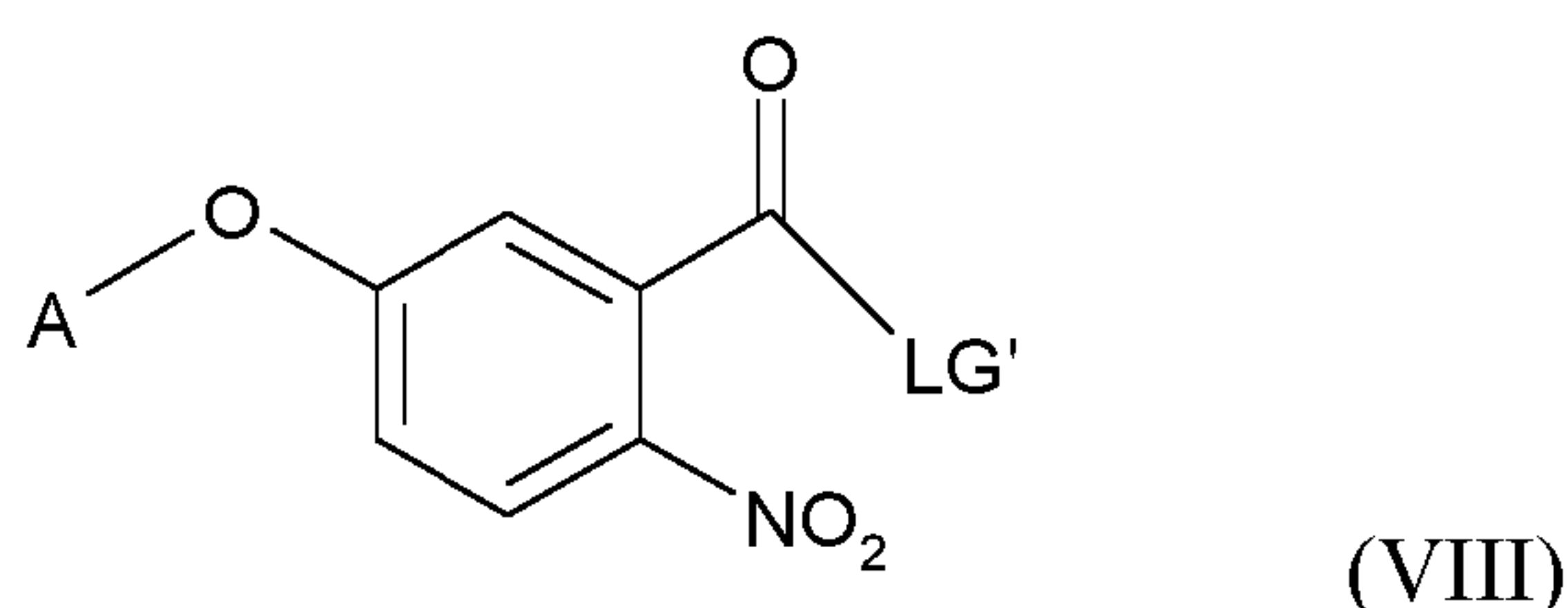


10 with a compound of formula



15 wherein the variables are as defined above, followed by the reduction of the nitro group and further reacting the resulting amine with methane sulfonyl chloride. The details of these reactions are known from textbooks of organic chemistry. The compounds of formula (VI) may be prepared in analogy to the compounds of formula (II). The compounds of formula (VII) are known per se and are commercially available.

20 **[0068]** The compounds of the formula (I), wherein n is 1 may also be prepared by reaction of a compound of formula

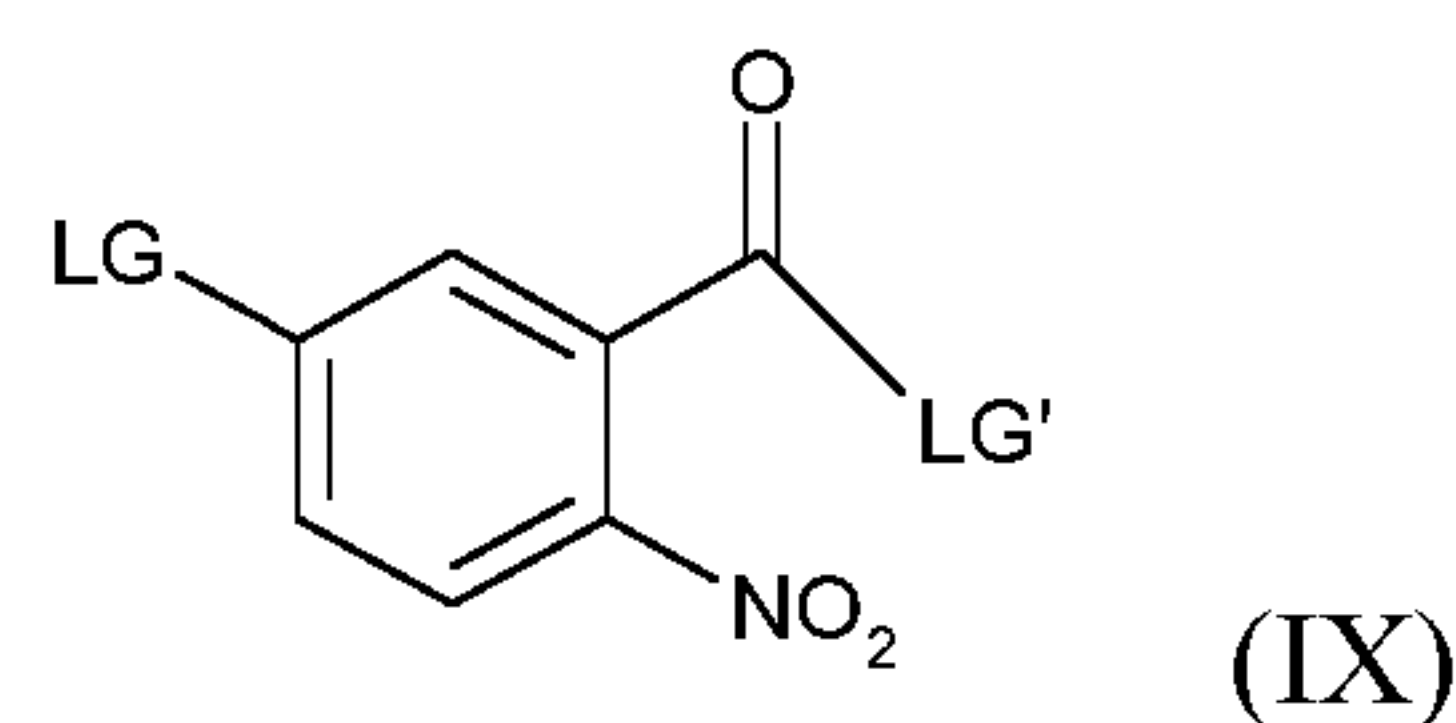


30 with a compound of formula

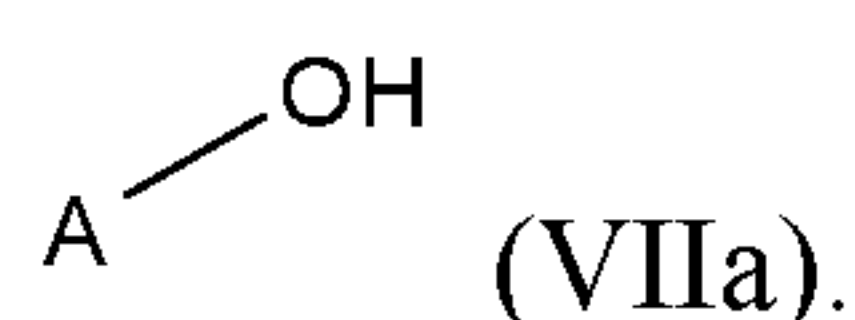


35 wherein the variables each have the above given meaning, followed by the reduction of the nitro group and further reacting the resulting amine with methane sulfonyl chloride. In the alternative, the nitro group of the compound of formula (VIII) may first of all be reduced and the resulting amino group be reacted with methane sulfonyl chloride, before the reaction with the compound of formula (V) is performed.

40 **[0069]** The compounds of formula (VIII) may be prepared in a manner known per se, for example by reaction of a compound of formula



50 with a compound of formula



55 **[0070]** The Examples further illustrate the different synthesis methods.

[0071] The compounds of formula (I) are notable for their broad activity spectrum and are valuable active ingredients for use in pest control, including in particular the control of endoparasites, especially helminths, in and on warm-blooded

animals, especially productive livestock and pets, whilst being well-tolerated by warm-blooded animals and fish.

[0072] Productive livestock includes mammals such as, for example, cattle, horses, sheep, pigs, goats, donkeys, rabbits, deer, as well as birds, for example chickens, geese, turkeys, ducks and exotic birds.

[0073] Pets include, for example, dogs, cats and hamsters, in particular dogs and cats. The compounds of formula (I) of the present invention are effective against helminths, in which the endoparasitic nematodes and trematodes may be the cause of serious diseases of mammals and poultry. Typical nematodes of this indication are: *Filariidae*, *Setariidae*, *Haemonchus*, *Trichostrongylus*, *Ostertagia*, *Nematodirus*, *Cooperia*, *Ascaris*, *Bunostomum*, *Oesophagostomum*, *Charbertia*, *Trichuris*, *Strongylus*, *Trichonema*, *Dictyocaulus*, *Capillaria*, *Heterakis*, *Toxocara*, *Ascaridia*, *Oxyuris*, *Ancylostoma*, *Uncinaria*, *Toxascaris* and *Parascaris*. The trematodes include, in particular, the family of *Fasciolidae*, especially *Fasciola hepatica* (liver fluke).

[0074] It could also be shown surprisingly and unexpectedly that the compositions of the present invention have exceptionally high efficacy against nematodes that are resistant to many active substances. This can be demonstrated, for example *in vitro* by the LDA test.

[0075] Certain pests of the species *Nematodirus*, *Cooperia* and *Oesophagostomum* infest the intestinal tract of the host animal, while others of the species *Haemonchus* and *Ostertagia* are parasitic in the stomach and those of the species *Dictyocaulus* are parasitic in the lung tissue. Parasites of the families and may be found in the internal cell tissue and in the organs, e.g. the heart, the blood vessels, the lymph vessels and the subcutaneous tissue. A particularly notable parasite is the heartworm of the dog, *Dirofilaria immitis*. The compounds of formula (I) according to the present invention are highly effective against these parasites.

[0076] The pests which may be controlled by the compounds of formula (I) of the present invention also include those from the class of *Cestoda* (tapeworms), e.g. the families *Mesocoestoidae*, especially of the genus *Mesocoestoides*, in particular *M. lineatus*; *Dipylidiidae*, especially *Dipylidium caninum*, *Joyeuxiella* spp., in particular *Joyeuxiella pasquali*, and *Diplopylidium* spp., and *Taeniidae*, especially *Taenia pisiformis*, *Taenia cervi*, *Taenia ovis*, *Taenia hydatigena*, *Taenia multiceps*, *Taenia taeniaeformis*, *Taenia serialis*, and *Echinococcus* spp., most preferably *Taenia hydatigena*, *Taenia ovis*, *Taenia multiceps*, *Taenia serialis*; *Echinococcus granulosus* and *Echinococcus multilocularis*.

[0077] Furthermore, the compounds of formula (I) are suitable for the control of human pathogenic parasites. Of these, typical representatives that appear in the digestive tract are those of the genus *Ancylostoma*, *Necator*, *Ascaris*, *Strongyloides*, *Trichinella*, *Capillaria*, *Trichuris* and *Enterobius*. The compounds of the present invention are also effective against parasites of the genus *Wuchereria*, *Brugia*, *Onchocerca* and *Loa* from the family of *Dracunculidae* and parasites of the genus *Strongyloides* and *Trichinella*, which infect the gastrointestinal tract in particular.

[0078] The good endoparasitocidal activity of the compounds of formula (I) corresponds to a mortality rate of at least 50-60%, in particular at least 80% and especially at least 90% of the endoparasites mentioned.

[0079] Administration of the compounds of formula (I) according to the invention may be effected therapeutically or preferably prophylactically.

[0080] Application of the compounds of formula (I) according to the invention to the animals to be treated may take place, for example, topically, perorally, parenterally or subcutaneously. A preferred embodiment of the invention relates to compounds of formula (I) for parenteral use or, in particular, for peroral use.

[0081] Preferred application forms for usage on warm-blooded animals in the control of nematodes/ helminths comprise solutions; emulsions including classical emulsions, microemulsions and self-emulsifying compositions, that are waterless organic, preferably oily, compositions which form emulsions - together with body fluids - upon addition to an animal body; suspensions (drenches); pour-on formulations; food additives; powders; tablets including effervescent tablets; boli; capsules including micro-capsules; and chewable treats; whereby the physiological compatibility of the formulation excipients must be taken into consideration. Particularly preferred application forms are tablets, capsules, food additives or chewable treats.

[0082] The compounds of formula (I) of the present invention are employed in unmodified form or preferably together with adjuvants conventionally used in the art of formulation and may therefore be processed in a known manner to give, for example, emulsifiable concentrates, directly dilutable solutions, dilute emulsions, soluble powders, powder mixtures, granules or microencapsulations in polymeric substances. As with the compositions, the methods of application are selected in accordance with the intended objectives and the prevailing circumstances.

[0083] The formulation, i.e. the agents, preparations or compositions containing the one or more active ingredients and optionally a solid or liquid adjuvant, are produced in a manner known *per se*, for example by intimately mixing and/or grinding the active ingredients with the adjuvants, for example with solvents, solid carriers and/or surface-active compounds (surfactants).

[0084] The solvents in question may be: alcohols, such as ethanol, propanol or butanol, and glycols and their ethers and esters, such as propylene glycol, dipropylene glycol ether, ethylene glycol, ethylene glycol monomethyl or -ethyl ether, ketones, such as cyclohexanone, isophorone or diacetanol alcohol, strong polar solvents, such as N-methyl-2-pyrrolidone, dimethyl sulfoxide or dimethylformamide, or water, vegetable oils, such as rape, castor, coconut, or soybean oil, and also, if appropriate, silicone oils.

[0085] Suitable surfactants are, for example, non-ionic surfactants, such as, for example, nonylphenolpolyethoxyethanols; castor oil polyglycol ethers, for example macrogol glycerolhydroxystearate 40; polyethylene glycols; polypropylene/polyethylene oxide adducts; or fatty acid esters of polyoxyethylene sorbitan, e.g. polyoxyethylene sorbitan monooleate.

[0086] Solid carriers, for example for tablets and boli, may be chemically modified polymeric natural substances that are soluble in water or in alcohol, such as starch, cellulose or protein derivatives (e.g. methyl cellulose, carboxymethyl cellulose, ethylhydroxyethyl cellulose, proteins such as zein, gelatin and the like), as well as synthetic polymers, such as polyvinyl alcohol, polyvinyl pyrrolidone etc. The tablets also contain fillers (e.g. starch, microcrystalline cellulose, sugar, lactose etc.), glidants and disintegrants.

[0087] If the anthelmintics are present in the form of feed concentrates, then the carriers used are e.g. performance feeds, feed grain or protein concentrates. Such feed concentrates or compositions may contain, apart from the active ingredients, also additives, vitamins, antibiotics, chemotherapeutics or other pesticides, primarily bacteriostats, fungistats, coccidiostats, or even hormone preparations, substances having anabolic action or substances which promote growth, which affect the quality of meat of animals for slaughter or which are beneficial to the organism in another way.

[0088] Suitable compositions of the compounds of formula (I) may also contain further additives, such as stabilisers, antioxidants, for example tocopherols like α -tocopherol, anti-foaming agents, viscosity regulators, binding agents, colors or tackifiers, as well as other active ingredients, in order to achieve special effects. Preferably, the composition comprises from 0.001 to 1 % w/v of one or more antioxidants. If desired, the formulations of the present invention may comprise a color, for example in an amount of from 0.001 to 1 % w/v.

[0089] As a rule, an anthelmintic composition according to the invention contains 0.1 to 99 % by weight, especially 0.1 to 95 % by weight of a compound of formula (I), 99.9 to 1 % by weight, especially 99.8 to 5 % by weight of a solid or liquid admixture, including 0 to 25 % by weight, especially 0.1 to 25 % by weight of a surfactant.

[0090] In each of the processes according to the invention for pest control or in each of the pest control compositions according to the invention, the compounds of formula (I) can be used in all of their steric configurations or in mixtures thereof.

[0091] The disclosure also includes prophylactically protecting warm-blooded animals, especially productive livestock and pets, in particular dogs or cats, against parasitic helminths, which is characterised in that a compound of formula (I) or the active ingredient formulation prepared therefrom is administered to the warm-blooded animal as an additive to the feed, or to the drinks or also in solid or liquid form, orally or by injection or parenterally. The invention also includes the compounds of formula (I) according to the invention for usage in one of the said processes.

[0092] The compounds of formula (I) according to the invention may be used alone or in combination with other biocides. They may be combined with pesticides having the same sphere of activity e.g. to increase activity, or with substances having another sphere of activity e.g. to broaden the range of activity. It can also be sensible to add so-called repellents.

[0093] The following Examples illustrate the invention further.

[0094] Analysis of the purified samples is in each case done using a Waters Autopurification (HPLC/MS) system with a reversed phase column using method B described below. The samples are characterized by m/z and retention time. The above-given retention times relate in each case to the use of a solvent system comprising two different solvents, solvent A: H₂O + 0.01% HCOOH, and solvent B: CH₃CN + 0.01% HCOOH).

- Method B: column Waters XTerra MS C18 5 μ m, 50X4.6mm (Waters), flow rate of 3.00 mL/min with a time-dependent gradient as given in the Table:

Time [min]	A [%]	B [%]
0	90	10
0.5	90	10
2.5	5	95
2.8	5	95
2.9	90	10
3.0	90	10

Reference Example 1A

Synthesis of 2-(methylsulfonamido)-5-morpholino-N-(3,4,5-trichlorophenyl)benzamide (Ex. 1.2 in Table 1)

5 Step A: 5-chloro-2-nitro-N-(3,4,5-trichlorophenyl) benzamide.

10 **[0095]** 5-chloro-2-nitrobenzoic acid (10 g) was treated with thionyl chloride (7.2 mL) at reflux for 4h. Excess SOCl₂ was removed under vacuum. CH₂Cl₂ (100 mL) was added to the acyl chloride. At 0°C, 3,4,5-trichloroaniline (9.7 g) and NEt₃ (13.8 mL) in 100 mL CH₂Cl₂ were added slowly. The reaction mixture was allowed to warm up and it was stirred at rt (room temperature) overnight. The reaction mixture was diluted with 200 mL diethyl ether. 10 mL HCl 2 N and 200 mL H₂O were added, and the mixture was stirred until a yellow precipitate is formed. The precipitate was filtered off and dried under high vacuum before analysis (yield: 66%). LCMS (method B): 380.59 (M+H)⁺ at 1.97 min.

15 Step B: 5-morpholino-2-nitro-N-(3,4,5-trichlorophenyl)benzamide

[0096] To a solution of 300 mg of 5-chloro-2-nitro-N-(3,4,5-trichlorophenyl)benzamide in 1.5 mL DMF, was added morpholine (206 µL). The reaction mixture was heated at 110°C for 1.5 h. After work-up and extraction with AcOEt, the mixture was evaporated to dryness. The title compound was pure enough to be engaged in step B. (yield: 71%). LCMS (method B): 427.7 (M-H)⁻ at 1.81 min.

20 Step C: 2-amino-5-morpholino-N-(3,4,5-trichlorophenyl)benzamide

25 **[0097]** Under N₂, 5-morpholino-2-nitro-N-(3,4,5-trichlorophenyl)benzamide (230 mg) in 4 mL EtOH/H₂O (3/1) was treated with Fe (208 mg) and HCl 25% (4 µL) and the reaction mixture was stirred at rt for 4 h. When the reduction was completed, the reaction mixture was filtered on a plug of celite and washed with ethyl acetate. The filtrate was evaporated under vacuum. Ethyl acetate was added, and the organic layer was washed with brine, dried over MgSO₄, and evaporated to dryness (yield: 95%). LCMS (method B): 399.68 (M+H)⁺ at 1.61 min.

30 Step D: 2-(methylsulfonamido)-5-morpholino-N-(3,4,5-trichlorophenyl)benzamide

35 **[0098]** A N₂ degassed solution of 2-amino-5-morpholino-N-(3,4,5-trichlorophenyl)benzamide (193 mg) in 3 mL CH₂Cl₂, pyridine (0.194 mL) was added. The mixture was cooled to 0°C before the drop wise addition of methane sulfonyl chloride (0.037 mL). The reaction mixture was stirred overnight at rt, then diluted with 50 mL ethyl acetate. The organic layer was washed with a saturated solution of Na₂CO₃, with brine, then dried over MgSO₄ and evaporated to dryness (yield: 43%). LCMS (method B): 477.7 (M+H)⁺ at 1.78 min.

Reference Example 1B

40 N-(3,5-bis (trifluoromethyl) phenyl)-5-(2-fluoropyridin-3-yl)-2-(methylsulfonamido) benzamide (Ex. 1.14 in Table 1)

Step A: methyl 5-bromo-2-(methylsulfonamido) benzoate.

45 **[0099]** A N₂ degassed solution of methyl 2-amino-5-bromobenzoate (2.8 g) in 10 mL 1 pyridine was cooled to 0°C before the drop wise addition of methane sulfonyl chloride (0.9 mL). The reaction mixture was stirred overnight at rt, then diluted with 50 mL ethyl acetate. The organic layer was washed with a saturated solution of Na₂CO₃, with brine, then dried over MgSO₄ and evaporated to dryness (yield: 82%). LCMS (method B): 305.6 (M-H)⁻ at 1.55 min.

Step B: 5-bromo-2-(methylsulfonamido)benzoic acid

50 **[0100]** Methyl 5-bromo-2-(methylsulfonamido) benzoate (3.15 g) was suspended in THF (20 mL, 1/1). NaOH 4 N (6.9 mL) was added and the reaction mixture was stirred 4h at reflux. Upon completion, the reaction mixture was treated with 2N HCl (1mL) and extracted twice with ethyl acetate. Combined organic layers were washed with H₂O, brine, dried over Na₂SO₄, filtered and evaporated to dryness. The title product was pure enough by LCMS to be engaged into next step without further purification. (yield: 66%) LCMS (method B): 291.64 (M-H)⁻ at 1.2 min.

55

Step C: N-(3,5-bis(trifluoromethyl)phenyl)-5-bromo-2-(methylsulfonamido)benzamide.

[0101] 5-bromo-2-(methylsulfonamido) benzoic acid (2.4 g) was treated with thionyl chloride (23 mL) at reflux for 4h.

Excess SOCl_2 was removed under vacuum. CH_2Cl_2 (20 mL) was added to the acyl chloride. At 0°C , 3,5-bis(trifluoromethyl)aniline (1.4 mL) and NEt_3 (5.68 mL) in 10 mL CH_2Cl_2 were added slowly. The reaction mixture was allowed to warm up and it was stirred at rt overnight.

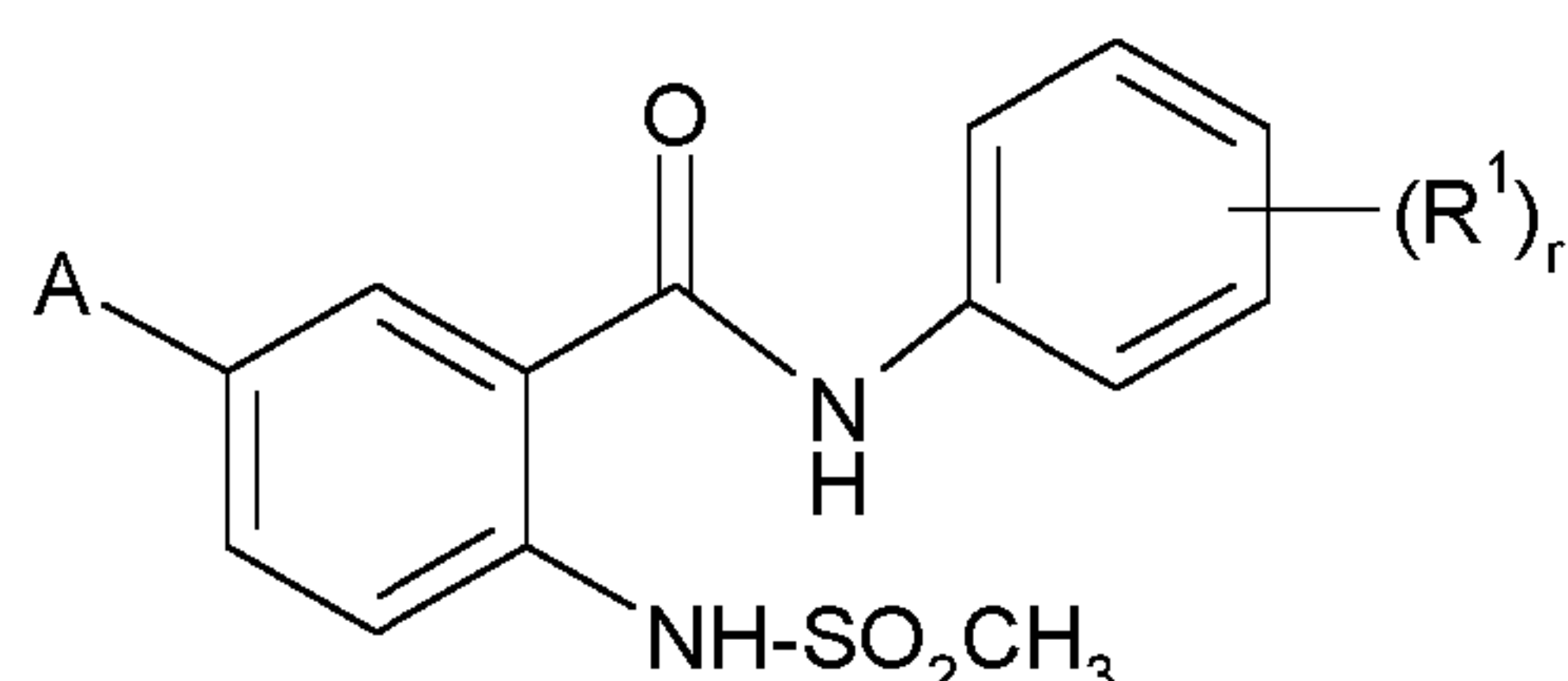
[0102] The reaction mixture was diluted with 30 mL CH_2Cl_2 . 20 mL HCl 2 N and 20 mL H_2O were added, and the mixture was stirred until a yellow precipitate is formed. The precipitate was filtered off and dried under high vacuum before analysis (yield: 67%). LCMS (method B): 502.93 (M-H)⁻ at 1.99 min.

Step D: N-(3,5-bis (trifluoromethyl) phenyl)-5-(2-fluoropyridin-3-yl)-2-(methylsulfonamido) benzamide.

[0103] To a solution of N-(3,5-bis(trifluoromethyl)phenyl)-5-bromo-2-(methylsulfonamido) benzamide (0.2 g) and 2-Fluoro-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pyridine (133 mg) under N_2 in dioxane/ H_2O (6 mL, 1/1) was added Na_2CO_3 (252 mg), $\text{Pd(dppf)Cl}_2 \cdot \text{CH}_2\text{Cl}_2$ (355 mg). The reaction mixture was stirred for 3h at 80°C . It was diluted with ethyl acetate, filtered through celite. The filtrate was washed with H_2O , brine, dried over Na_2SO_4 , filtered and evaporated to dryness.

[0104] The crude mixture was purified by flash chromatography eluting with a gradient of 100% heptane to 60% heptane/40% ethyl acetate to offer the title compound in 25% yield. LCMS (method C): 521.8 (M+H)⁺ at 1.90 min.

[0105] The substances named in the following Table 1 are prepared analogously to the above-described methods. The compounds are of formula



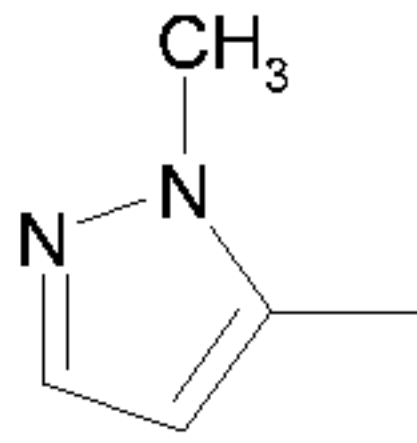
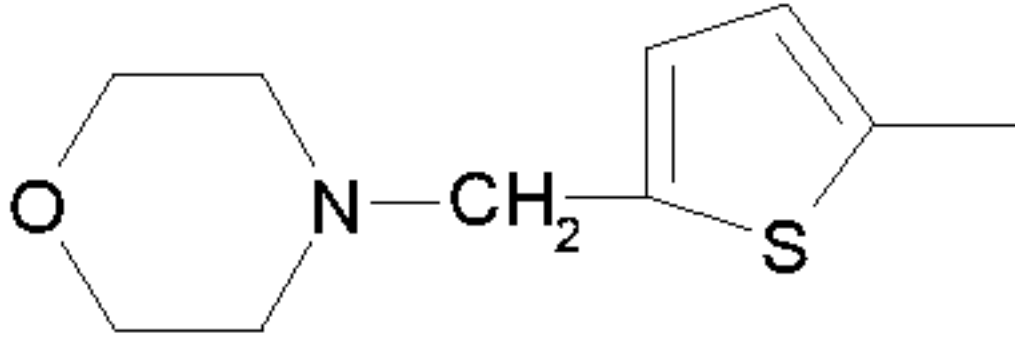
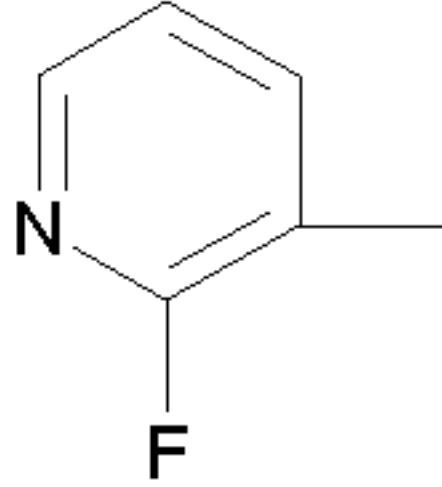
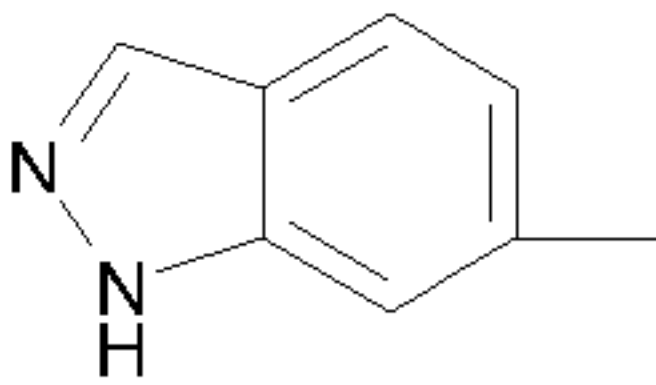
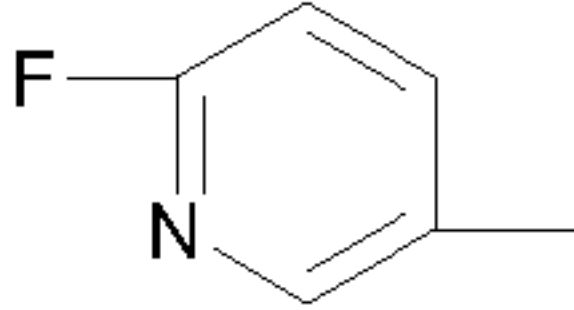
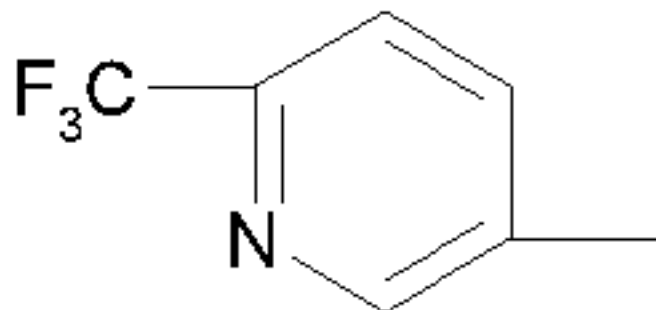
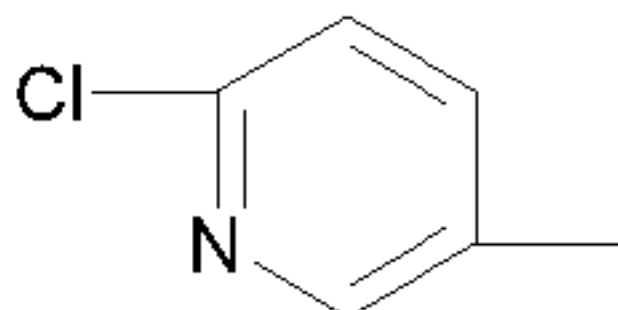
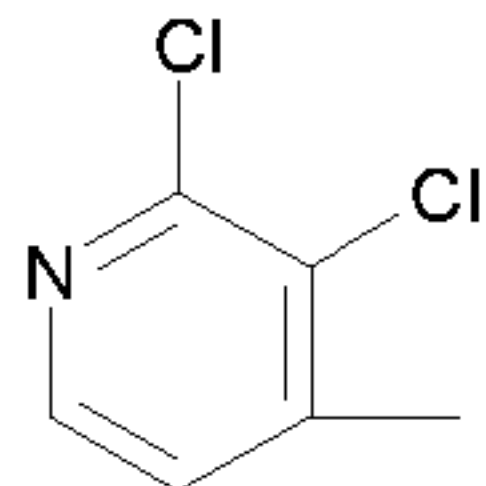
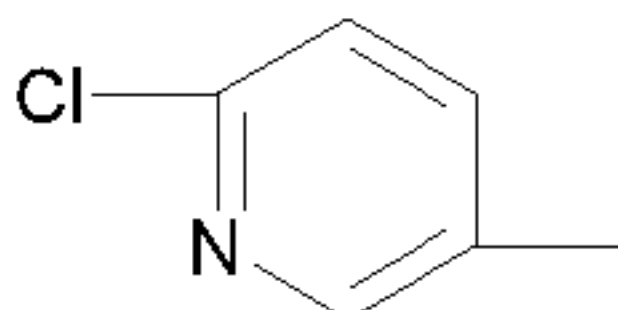
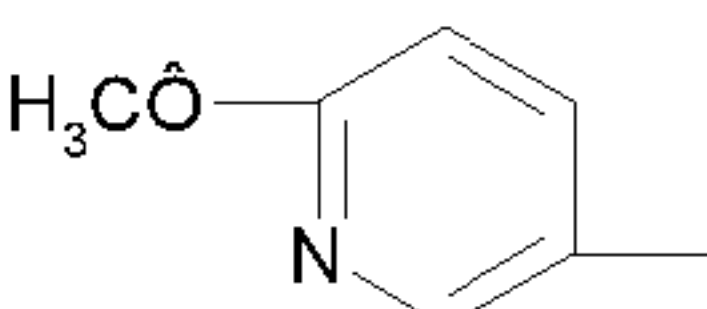
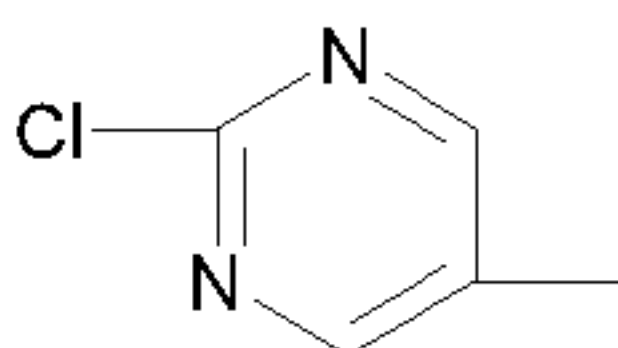
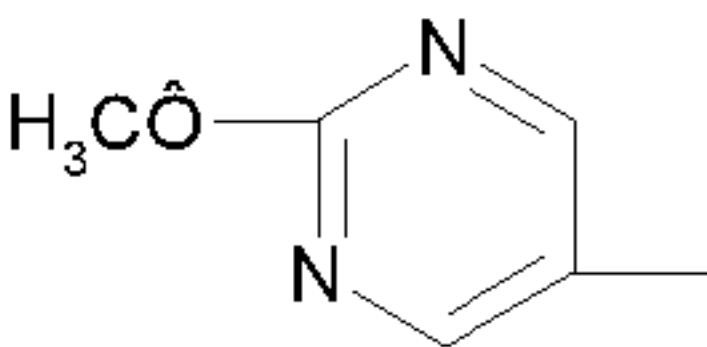
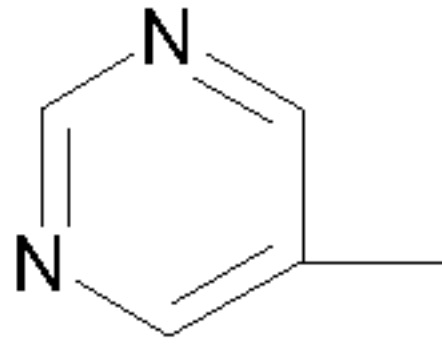
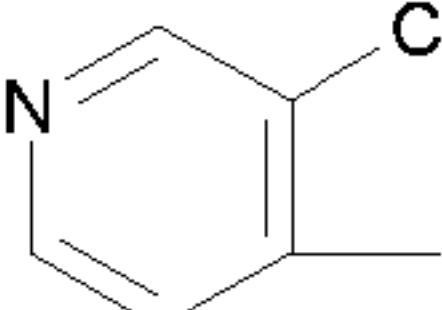
wherein the meaning of A and $(\text{R}^1)_r$ is given in Table 1.

[0106] The following physical data are obtained according to the above-described HPLC/MS characterization process (method B). R_t refers to "retention time".

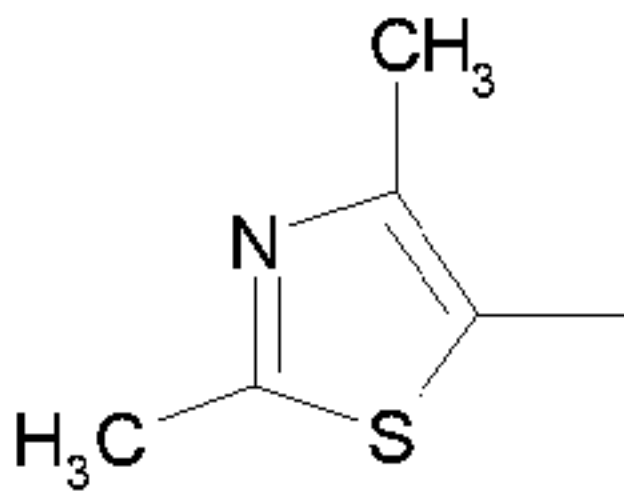
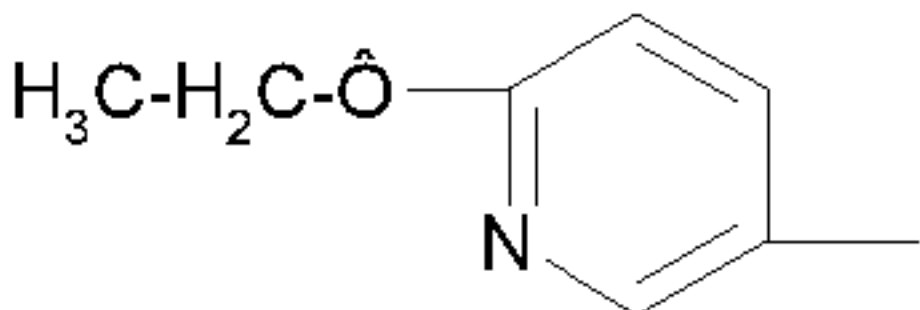
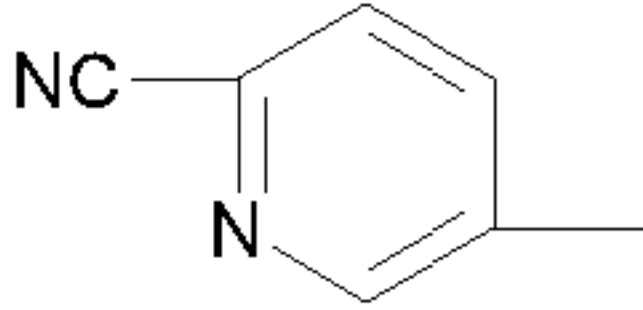
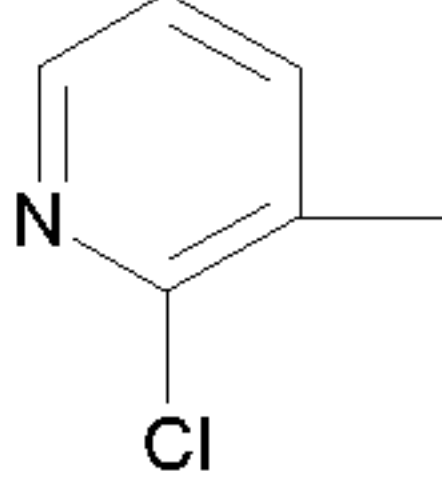
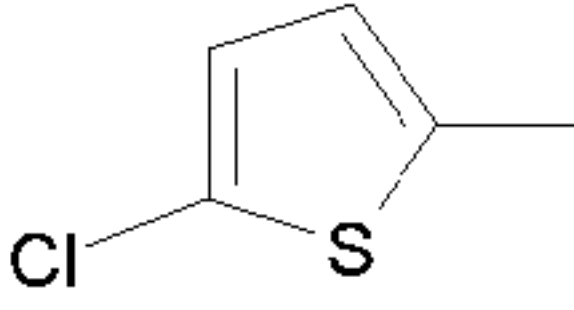
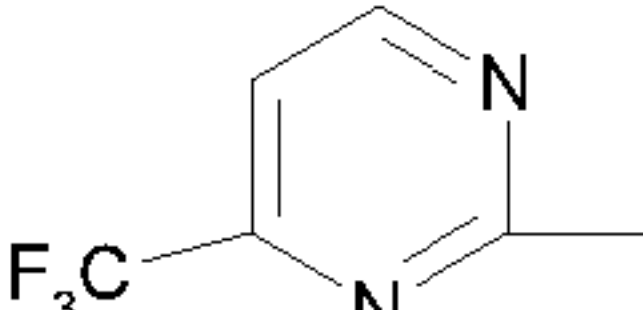
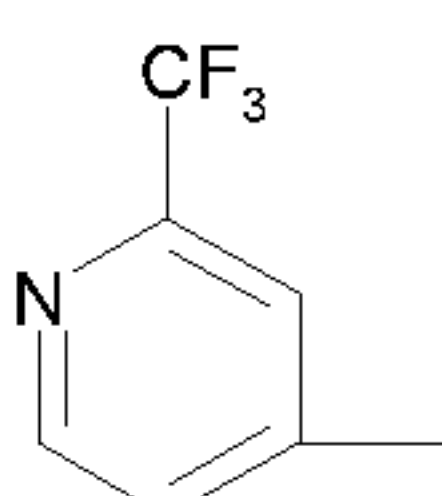
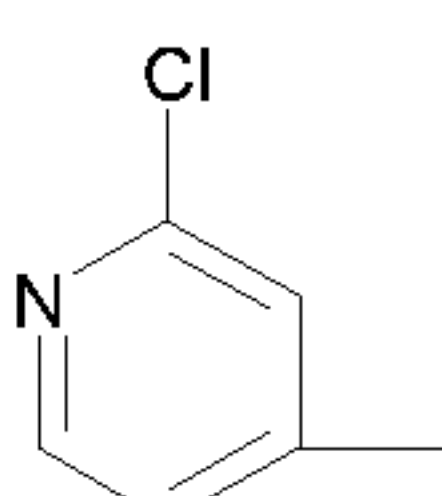
Table 1:

Ex. No.	A	$(\text{R}^1)_r$	m/z: [M+H ⁺]	R_t [min] (Method B)	Physical state
1.2	Morpholin-4-yl	3,4,5-tri-Cl	477.7	1.78	Solid
1.3	4-Methylpiperazin-1-yl	3,4,5-tri-Cl	490.9	1.29	Solid
1.4	Thiazin-4-yl	3,4,5-tri-Cl	493.7	1.97	Solid
1.5	Pyrrolidin-1-yl	3,4,5-tri-Cl	461.7	2.04	Foam
1.6	Pyrazol-1-yl	3,4,5-tri-Cl	458.8	1.89	Powder
1.7	Isopropyl	3,5-di- CF_3	468.8	2.07	Powder
1.8	CF_3	3,5-di- CF_3	494.5	1.99	Oil
1.9		3,5-di- CF_3	552.9	2.22	Powder
1.10		3,5-di- CF_3	550.7	1.99	Powder
1.11		3,5-di- CF_3	534.8	1.78	Solid

(continued)

Ex. No.	A	(R ¹) _r	m/z: [M+H ⁺]	R _t [min] (Method B)	Physical state
1.12		3,5-di-CF ₃	506.7	1.79	Powder
1.13		3,5-di-CF ₃	607.9	1.27	Resin
1.14		3,5-di-CF ₃	521.8	1.90	Powder
1.15		3,5-di-CF ₃	542.8	1.85	Powder
1.16		3,5-di-CF ₃	521.7	1.94	Powder
1.17		3,5-di-CF ₃	571.7	2.06	Foam
1.18		3,5-di-CF ₃	537.7	2.00	Powder
1.19		3,5-di-CF ₃	571.6	2.10	Powder
1.20		3,5-di-CF ₃	551.7	2.06	Powder
1.21		3,5-di-CF ₃	533.7	2.02	Powder
1.22		3,5-di-CF ₃	538.7	1.93	Powder
1.23		3,5-di-CF ₃	534.7	1.85	Powder
1.24		3,5-di-CF ₃	504.8	1.71	Powder
1.25		3,5-di-CF ₃	537.8	1.90	Solid

(continued)

Ex. No.	A	(R ¹) _r	m/z: [M+H ⁺]	R _t [min] (Method B)	Physical state
1.26		3,5-di-CF ₃	537.8	1.89	Foam
1.27		3,5-di-CF ₃	548.0	2.08	Powder
1.28		3,5-di-CF ₃	529.0	1.89	Powder
1.29		3,5-di-CF ₃	537.9	1.94	Powder
1.30		3,5-di-CF ₃	542.9	2.28	Powder
1.31		3,5-di-CF ₃	572.9	2.11	Powder
1.32		3,5-di-CF ₃	571.8	2.05	Powder
1.33		3,5-di-CF ₃	537.7	1.99	Resin

Example 2

5-phenoxy-2-(phenylsulfonamido)-N-(3,4,5-trichlorophenyl)benzamide (Ex.2.2 in Table 2)

Step A: 2-nitro-5-phenoxy-N-(3,4,5-trichlorophenyl)benzamide.

[0107] 5-Chloro-2-nitro-N-(3,4,5-trichlorophenyl) benzamide (29.1 g), K₂CO₃ (21.3 g) and phenol (8 g) in DMA were heated at 140°C during 14h. The reaction mixture was poured in H₂O (100 mL), the precipitate was filtered off, dried under high vacuum to afford a brown solid (yield: 80%). LCMS (method B): 436.6 (M-H)⁻ at 2.14 min.

Step B: 2-amino-5-phenoxy-N-(3,4,5-trichlorophenyl)benzamide

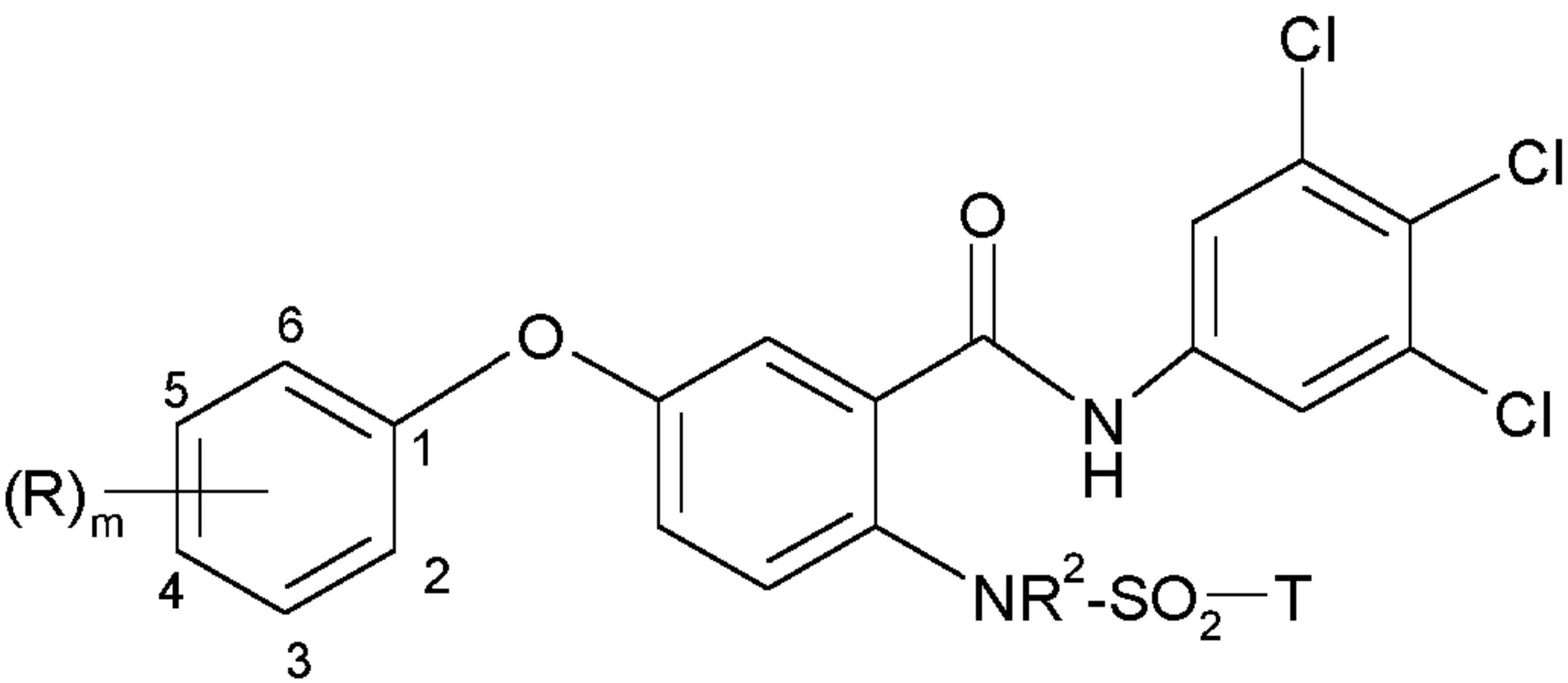
[0108] 2-nitro-5-phenoxy-N-(3,4,5-trichlorophenyl)benzamide treated with iron in a similar manner as described for step C Example 1 (yield: 27%). LCMS (method B): 406.7 (M+H)⁺ at 2.28 min.

Step C: 5-(4-Chlorophenoxy)-2-(methylsulfonamido)-N-(3,4,5-trichlorophenyl) benzamide

[0109] To N₂ degassed solution of 2-amino-5-phenoxy-N-(3,4,5-trichlorophenyl)benzamide (0.26 mg) in 2mL of CH₂Cl₂, pyridine (0.25 mL) was added. The mixture was cooled to 0°C before the drop wise addition of benzene sulfonyl chloride (0.124 mg). The reaction mixture was stirred overnight at rt, then diluted with additional 5 mL CH₂Cl₂. The

organic layer was washed with a saturated solution of Na₂CO₃, with brine, then dried over MgSO₄ and evaporated to dryness (yield: 81%). LCMS (method B): 546.7 (M+H)⁺ at 2.39 min.

[0110] The substances named in the following Table 2 are prepared analogously to the above-described methods. The compounds are of formula



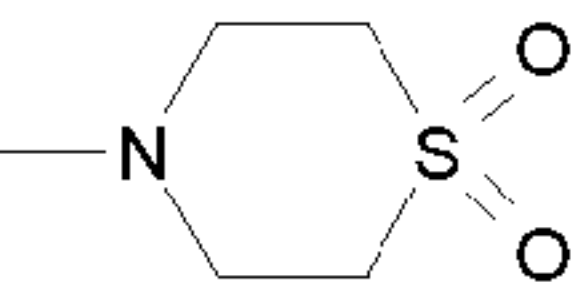
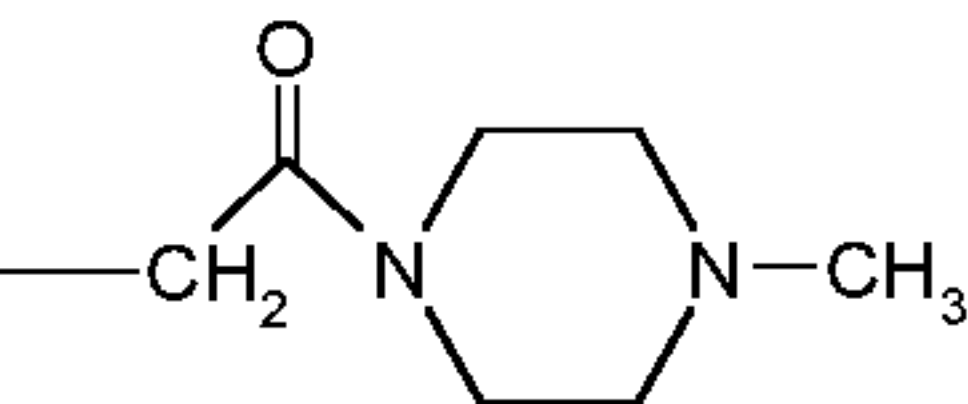
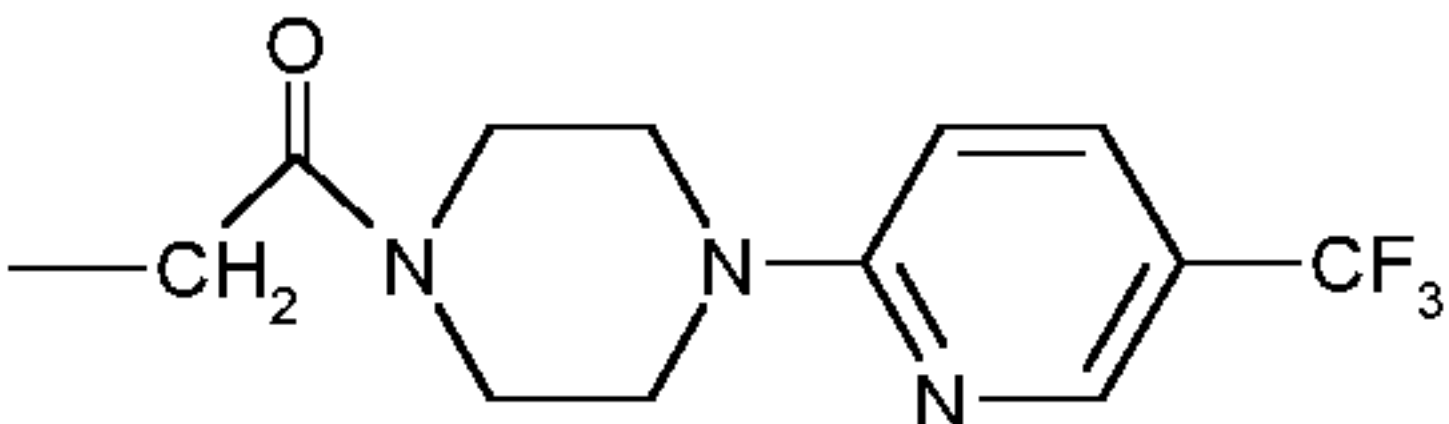
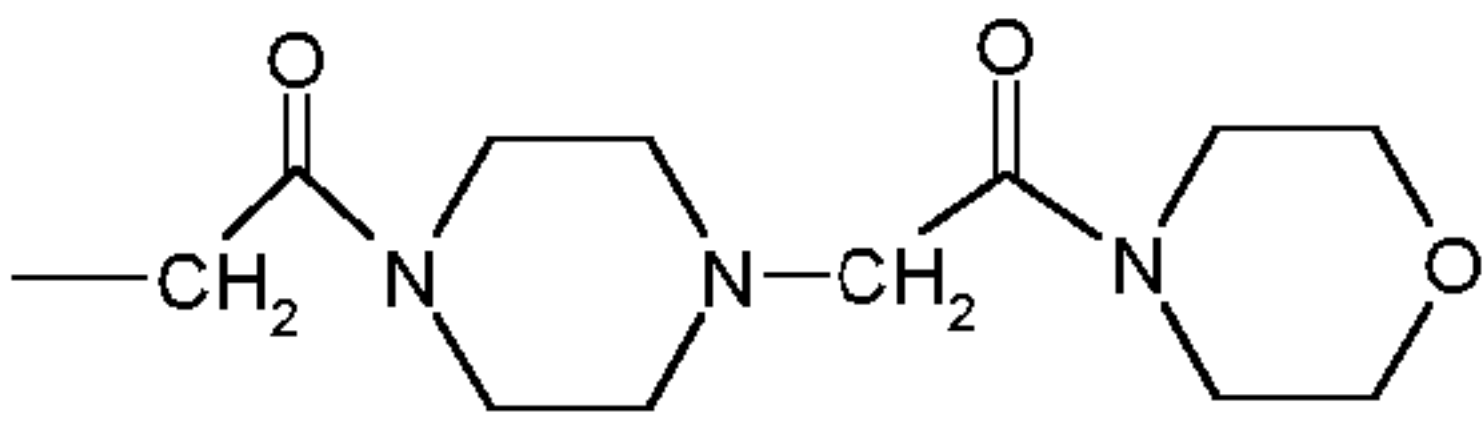
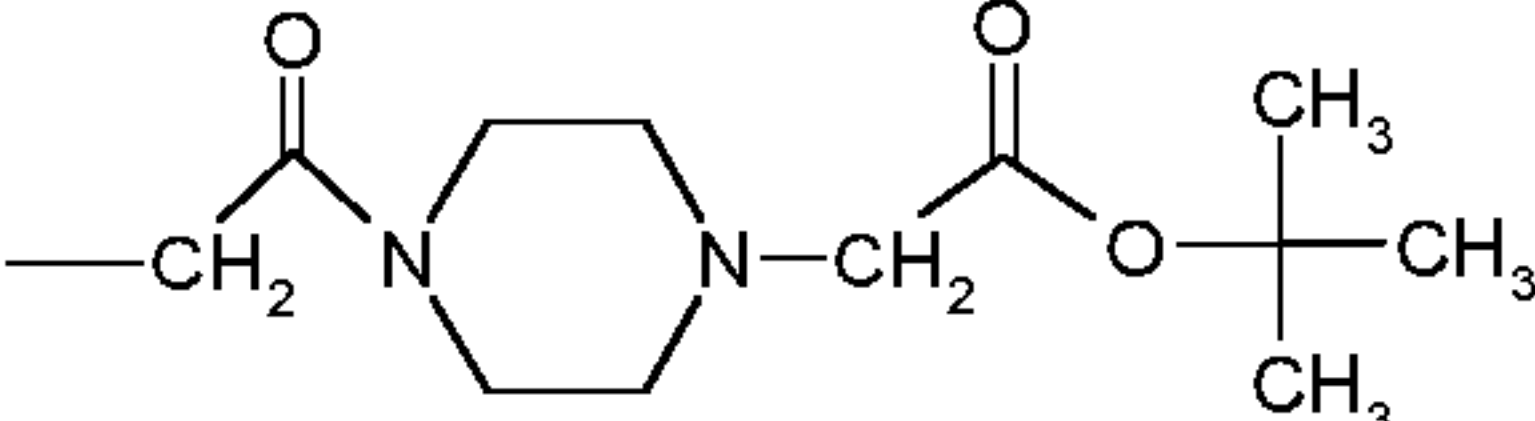
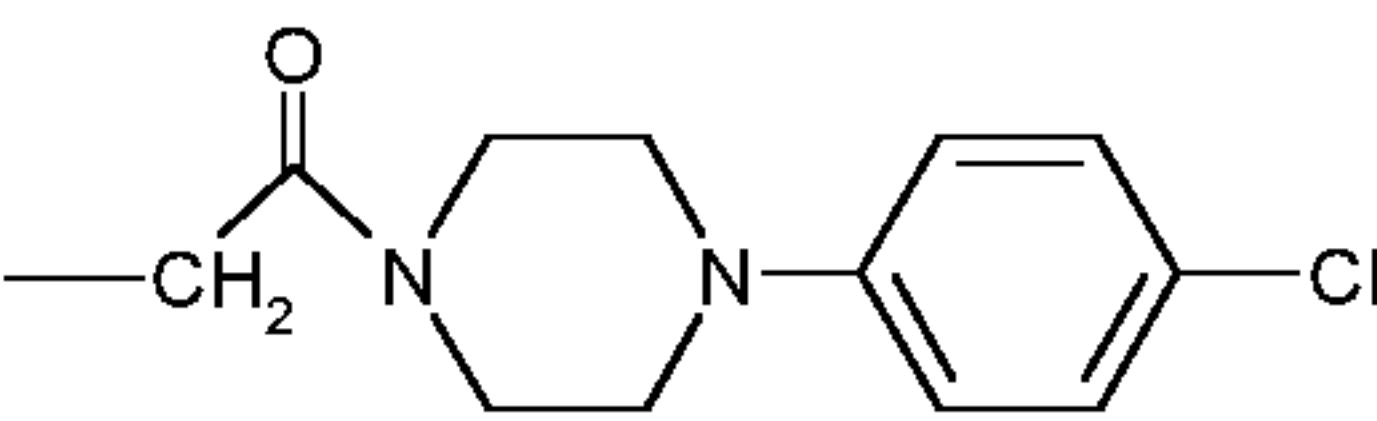
wherein the meaning of (R¹)_r, (R)_m, and X are given in Table 2

[0111] The following physical data are obtained according to the above-described HPLC/MS characterization process (Method B).

Table 2:

Ex. No.	(R) _m	T	R ²	m/z: [M+H ⁺]	R _t [min]	Physical state
2.1	4-Cl	4-CH ₃ -phenyl		594.6	2.22	Powder
2.2	H	phenyl	H	546.7	2.39	Powder
2.3	4-Cl	2-NO ₂ -4-CF ₃ -phenyl	H	693.6	1.88	Gum
2.4	4-Cl	3-Cl-4-F-phenyl	H	632.5	2.57	Solid
2.5	4-Cl	2-CF ₃ -4-F-phenyl	H	666.5	2.59	Solid
2.6	4-Cl	4-CF ₃ -phenyl	H	648.5	2.58	Solid
2.7	4-Cl	3,4-dimethoxyphenyl	H	640.6	2.40	Solid
2.8	4-Cl	4-nitrophenyl	H	625.5	2.46	Solid
2.9	4-Cl	4-chlorophenyl	H	614.7	2.59	Solid
2.10	4-Cl	3,5-di-Cl-phenyl	H	648.5	2.78	Solid
2.11	4-Cl	4-methoxyphenyl	H	610.6	2.46	Solid
2.12	4-Cl	2-Chloro-phenyl	H	614.5	2.57	Solid
2.13	4-Cl	3-Chlorophenyl	H	614.7	2.60	Solid
2.14	4-Cl	3-Pyridyl	H	581.6	2.31	Solid
2.15	4-Cl	3-methoxyphenyl	H	610.6	2.49	Solid
2.16	4-Cl	3,4-dichlorophenyl	H	648.5	2.71	Solid
2.17	4-Cl	2,6-dichlorophenyl	H	648.6	2.66	Solid
2.18	4-Cl	2-methoxyphenyl	H	610.6	2.43	Solid
2.19	4-Cl	2,4-dichlorophenyl	H	648.6	2.74	Solid
2.20	4-Cl	2-NO ₂ -4-OCH ₃ -phenyl	H	655.5	2.42	Powder
2.21	4-Cl	2,4-dimethoxyphenyl	H	640.6	2.41	Solid
2.22	4-Cl	ethyl	H	532.5	2.37	Solid
2.23	4-Cl	-CH ₂ CF ₃	H	586.4	2.39	Powder
2.24	4-Cl	-CH ₂ CH ₂ CF ₃	H	598.5	2.47	Solid

(continued)

Ex. No.	(R) _m	T	R ²	m/z: [M+H ⁺]	R _t [min]	Physical state
2.25	4-Cl	n-propyl	H	546.6	2.44	Solid
2.26	4-Cl	n-butyl	H	560.7	2.52	Solid
2.27	4-Cl	Iso-butyl	H	560.7	2.51	Powder
2.28	4-Cl	-CH ₂ CH ₂ Si(CH ₃) ₃	H	604.7	2.68	Powder
2.29	4-Cl	Cyclopropyl	H	544.6	2.36	Powder
2.30	4-Cl	Cyclohexyl	H	586.6	2.65	Powder
2.31	4-Cl	1-(benzyloxycarbonyl)-piperazin-4-yl	H	721.8	2.54	Powder
2.32	4-Cl	Isopropyl	H	546.6	2.23	Solid
2.33	4-Cl	Cyclohexylmethyl	H	600.6	2.74	Solid
2.34	4-Cl	(1R)-(-)-Campher	H	654.7	2.57	Solid
2.35	4-Cl	-CH ₂ C(O)OC ₂ H ₅	H	590.6	2.36	Solid
2.36	4-Cl	-CH ₂ C(O)OCH ₃	H	576.6	2.29	Foam
2.37	4-Cl	-CH ₂ C(O)OH	H	562.5	2.16	Solid
2.38	4-Cl	(1S)-(+)-Campher	H	654.8	2.55	Solid
2.39	4-Cl	Tetrahydro-2H-pyran-4-yl	H	588.6	2.33	Solid
2.40	4-Cl	-N(CH ₃) ₂	H	547.6	2.40	Powder
2.41	4-Cl	1-Methylpiperazin-4-yl	H	602.8	1.72	Powder
2.42	4-Cl		H	637.6	2.24	Powder
2.43	4-Cl	-CH ₂ -Cl	-SO ₂ CH ₂ Cl	664.4	2,44	Solid
2.44	4-Cl		H	644.6	1.52	Powder
2.45	4-Cl		H	775.6	2.63	Powder
2.46	4-Cl		H	757.8	1.59	Powder
2.47	4-Cl		H	744.7	2.41	Powder
2.48	4-Cl		H	740.6	2.68	Powder

Reference Example 3

2-(methylsulfonamido)-N-(3,4,5-trichlorophenyl)-5-((2-(trifluoromethyl)pyridin-3-yl)oxy)benzamide (Ex 3.2 in Table 3)

Step A: methyl 2-nitro-5-((2-(trifluoromethyl) pyridin-3-yl)oxy)benzoate.

[0112] Methyl 5-chloro-2-nitrobenzoate was treated in a similar manner as step A of synthesis of example 3 (yield: 28%). LCMS (method B): 342.86 (M+H)⁺ at 1.63 min.

Step B: 2-nitro-5-((2-(trifluoromethyl) pyridin-3-yl)oxy)benzoic acid.

[0113] Methyl 2-nitro-5-((2-(trifluoromethyl) pyridin-3-yl)oxy)benzoate (277 mg) was treated overnight at rt with NaOH IN (4.13 mL) in THF/MeOH (8 mL, 2/1) (yield: 98%). LCMS (method B): 328.84 (M+H)⁺ at 1.33 min.

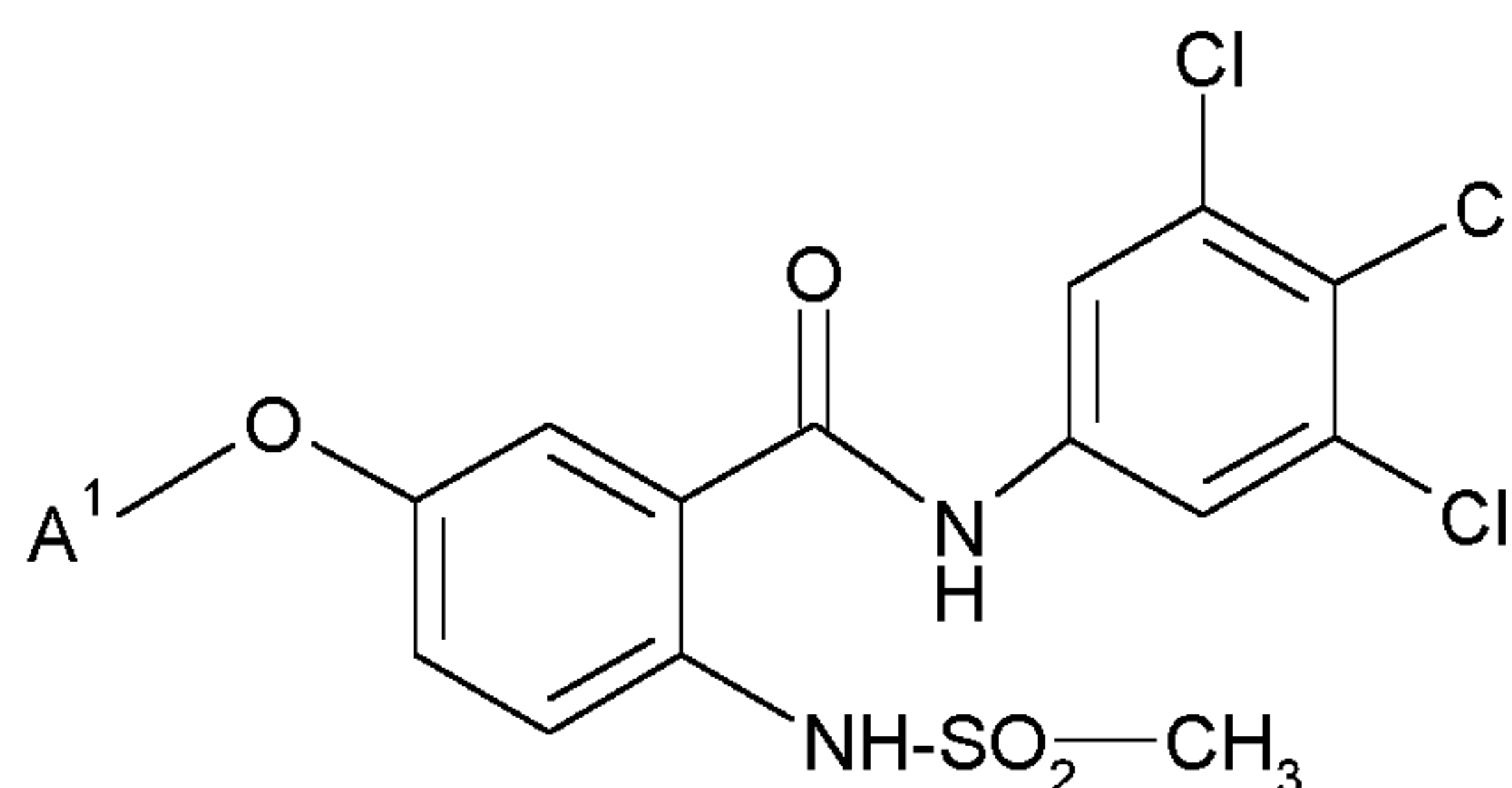
Step C: 2-nitro -N- (3,4,5-trichlorophenyl) -5- ((2-(trifluoromethyl)pyridin-3-yl)oxy) benzamide

[0114] 2-nitro-5-((2-(trifluoromethyl) pyridin-3-yl) oxy) benzoic acid was treated in a similar manner as step A of synthesis of example 1 (yield: 45%). LCMS (method B): 505.7 (M+H)⁺ at 2.05 min.

Step D: 2-amino -N- (3,4,5-trichlorophenyl) -5- ((2-(trifluoromethyl) pyridine -3- yl)oxy) benzamide 2-nitro-N-(3,4,5-trichlorophenyl)-5-((2-(trifluoromethyl) pyridin-3-yl) oxy) benzamide was treated in a similar manner as step C Example 1 (yield: 100%). LCMS (method B): 475.52 (M+H)⁺ at 2.21 min.

Step E: 2-(methylsulfonamido)-N-(3,4,5-trichlorophenyl)-5-((2-(trifluoromethyl)pyridin-3-yl)oxy) benzamide 2-amino-N-(3,4,5-trichlorophenyl)-5-((2-(trifluoromethyl) pyridine - 3- yl) oxy) benzamide was treated in a similar manner as step D of synthesis of example 1 (yield: 20%). LCMS (method C): 553.7 (M+H)⁺ at 2.07 min.

The substances named in the following Table 3 are prepared analogously to the above-described methods. The compounds are of formula



wherein the meaning of A¹ given in Table 3. The following physical data are obtained according to the above-described HPLC/MS characterization process.

Table 3:

Ex. No.	A ¹	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method)
3.1		556.7	2.09 (B)	Solid
3.2		553.7	2.07 (B)	Solid
3.3		551.7	3.95 (A)	Foam
3.4		558.8	2.95 (C)	Solid

Example 4

5-(4-chlorophenoxy)-2-(methylsulfonamido)-N-(4-(trifluoromethyl)oxazol-2-yl)benzamide (Ex 4.16 in Table 4)

[0118]

Step A: methyl 5-(4-chlorophenoxy)-2-nitrobenzoate methyl 5-chloro-2-nitrobenzoate was treated in a similar manner as step A of synthesis of example 3 (yield: 90%). LCMS (method B): 305.0 (M+H)⁺ at 1.67 min.

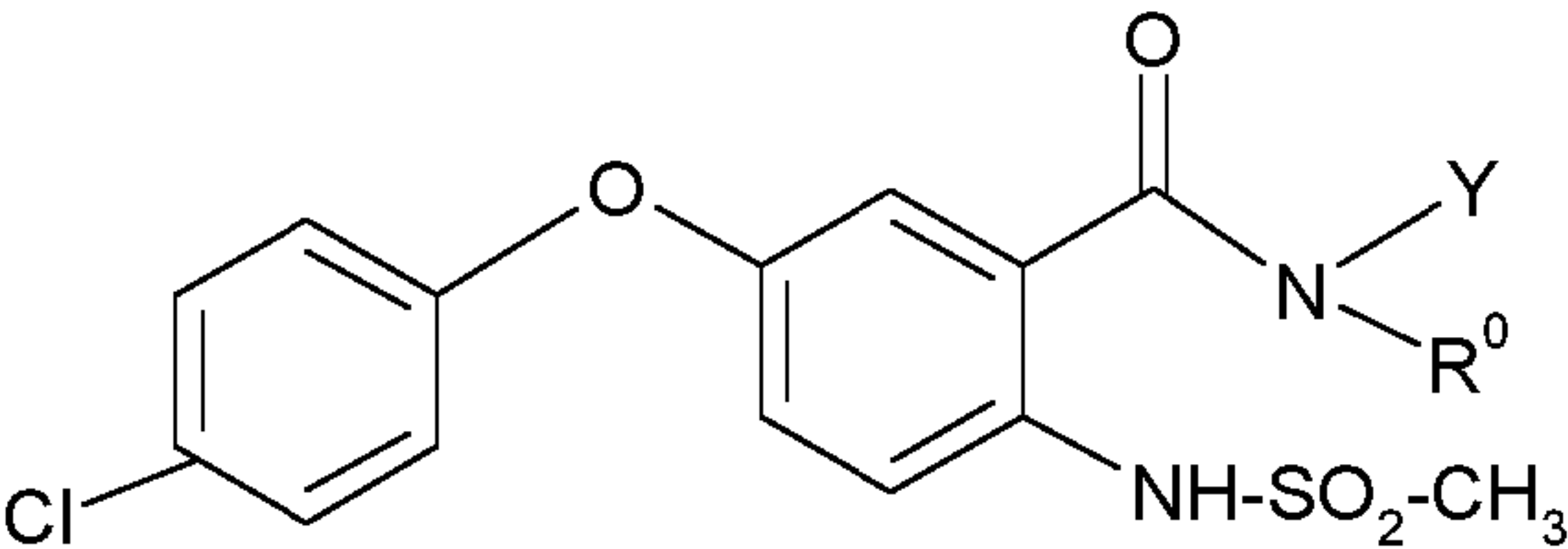
Step B: methyl 2-amino-5-(4-chlorophenoxy) benzoate methyl 5-(4-chlorophenoxy)-2-nitrobenzoate was treated in a similar manner as step C Example 1 (yield: 100%). LCMS (method B): 277.82 (M+H)⁺ at 1.88 min.

Step C: methyl 5-(4-chlorophenoxy)-2-(methylsulfonamido) benzoate methyl 2-amino-5-(4-chlorophenoxy)benzoate was treated in a similar manner as step D of synthesis of example 1 (yield: 95%). LCMS (method B): 353.78 (M-H)⁻ at 1.84 min.

Step D: 5-(4-chlorophenoxy)-2-(methylsulfonamido) benzoic acid methyl 5-(4-chlorophenoxy)-2-(methylsulfonamido)benzoate was saponified in a similar manner as step B of synthesis of example 4 (yield: 96%). LCMS (method B): 339.62 (M-H)⁻ at 1.61 min.

Step E: 5-(4-chlorophenoxy)-2-(methylsulfonamido)-N-(4-(trifluoromethyl) oxazol-2-yl)benzamide 5-(4-chlorophenoxy)-2-(methylsulfonamido) benzoic acid was treated in a similar manner as step A of synthesis of example 1 (yield: 3%). LCMS (method B): 475.64 (M+H)⁺ at 1.70 min.

[0119] The substances named in the following Table 4 are prepared analogously to the above-described methods. The compounds are of formula

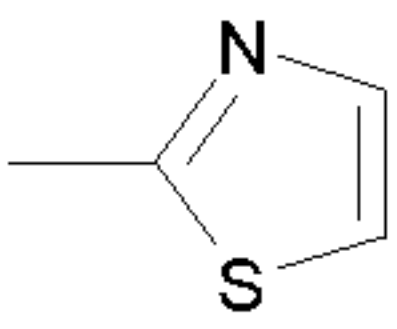
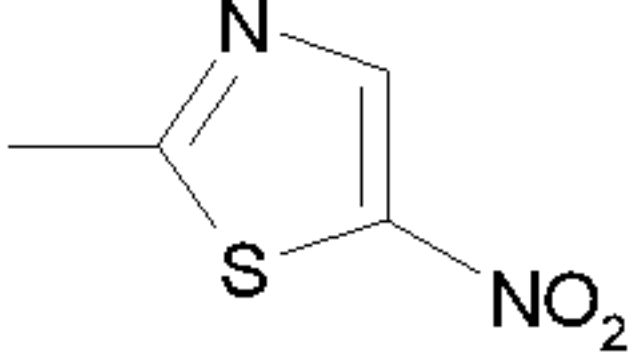
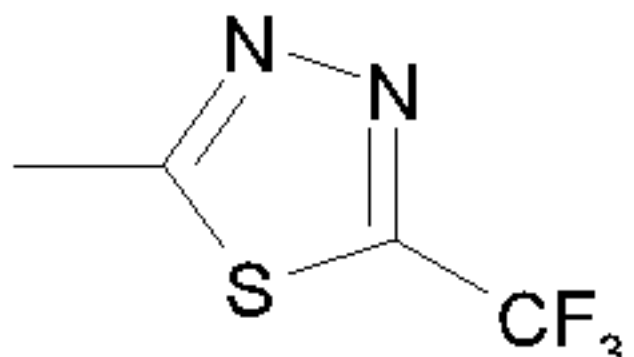
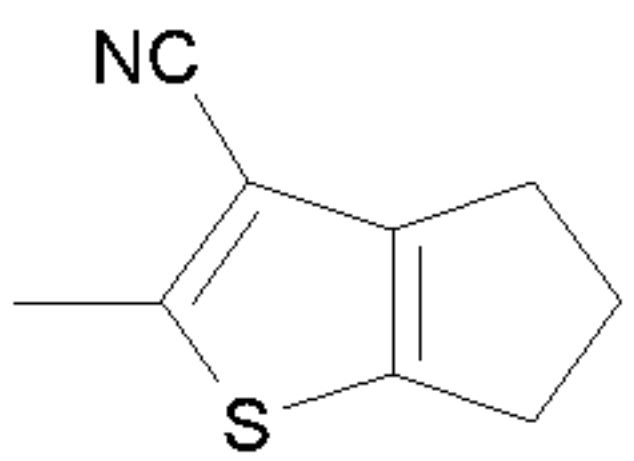
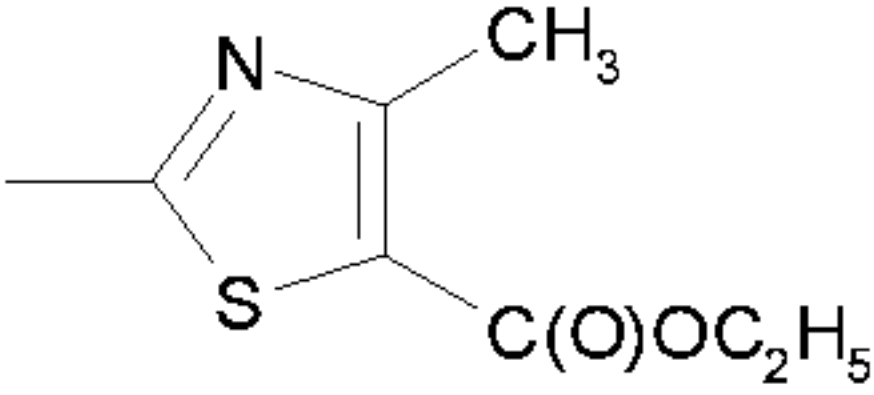
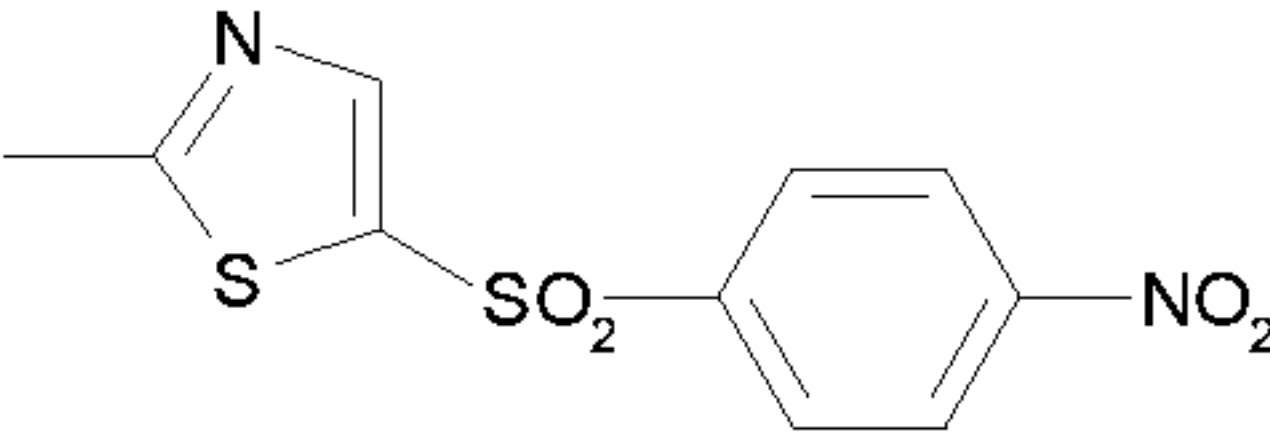
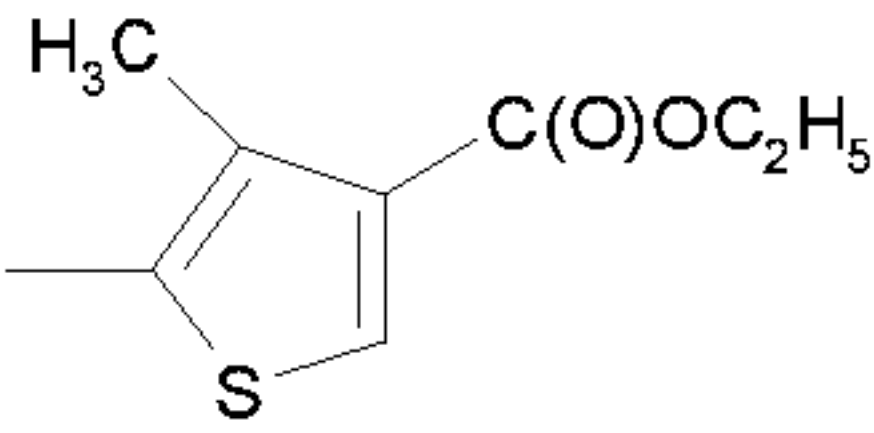
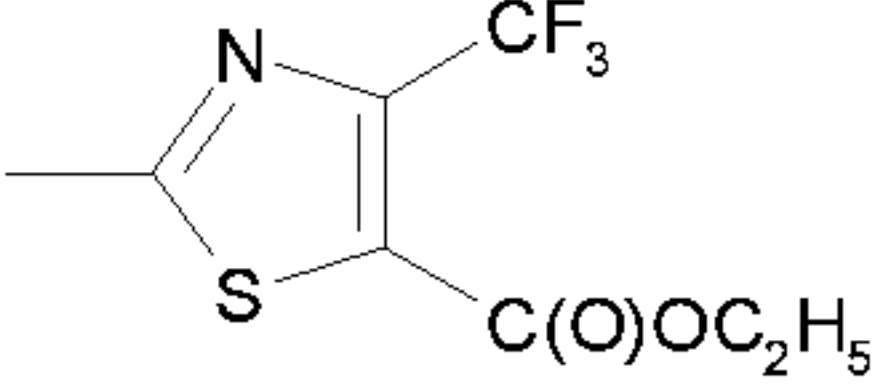
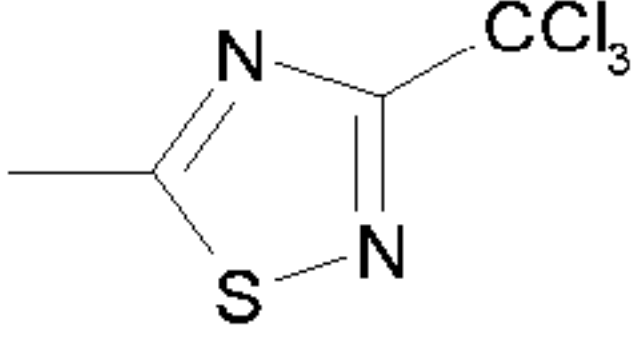
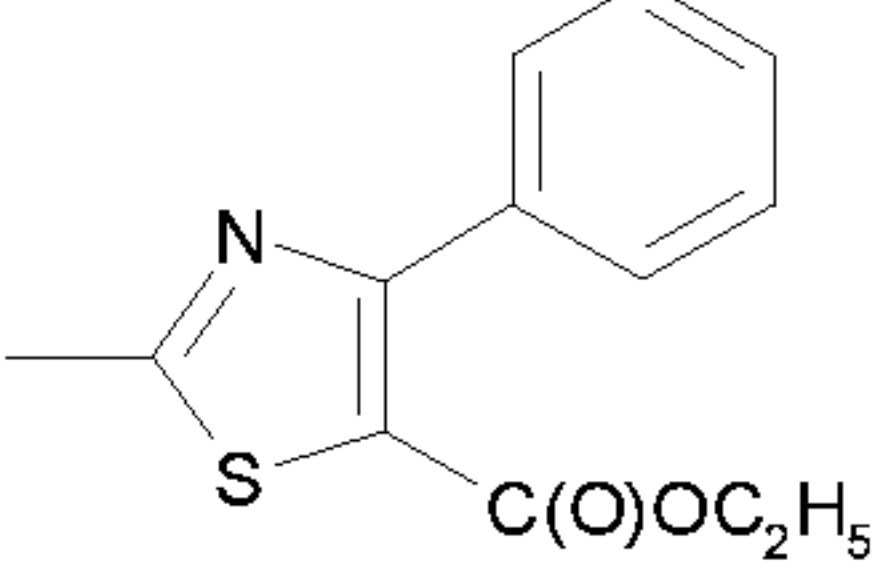
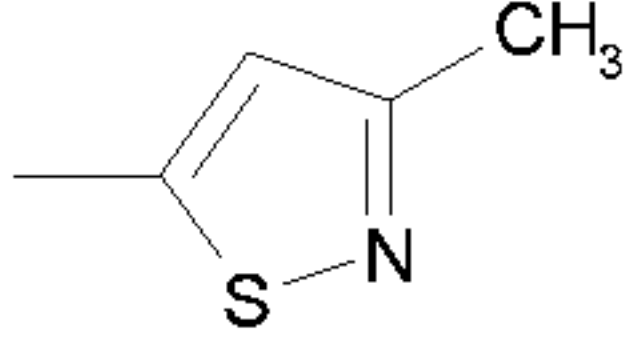
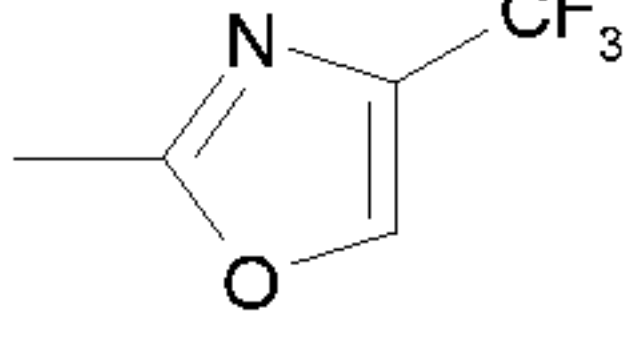
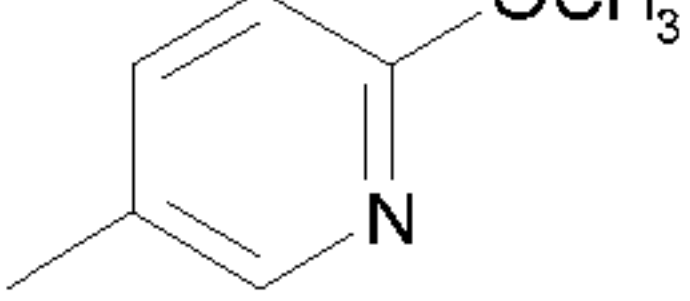


wherein the meaning of Y and R⁰ is given in Table 4. The following physical data are obtained according to the above-described HPLC/MS characterization process (Method B).

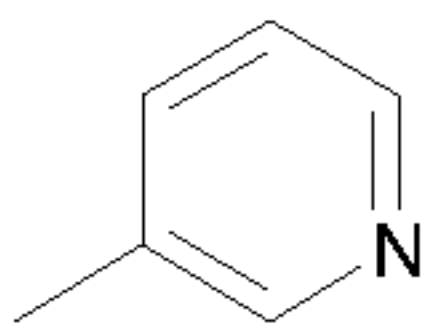
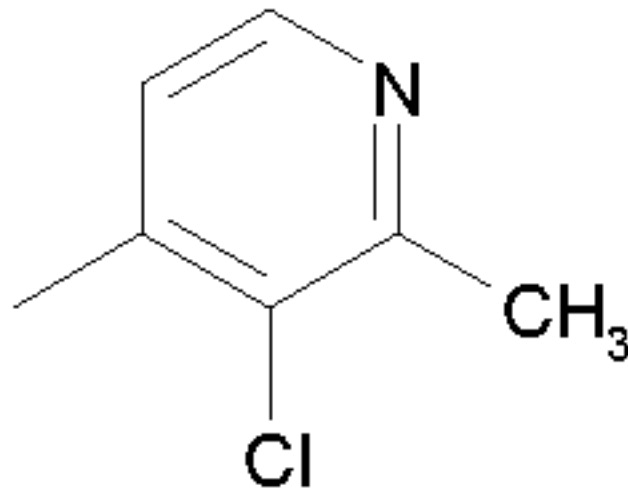
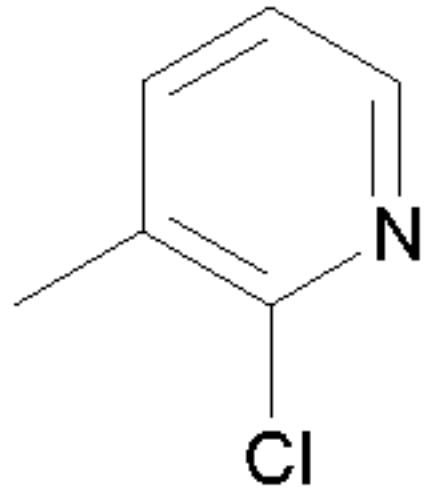
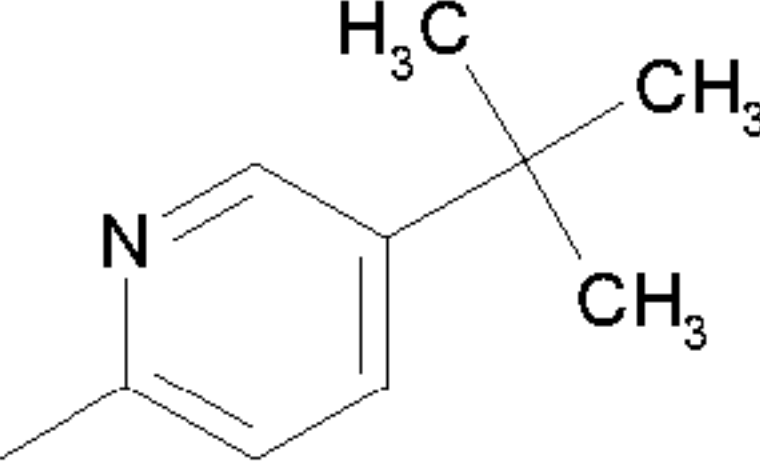
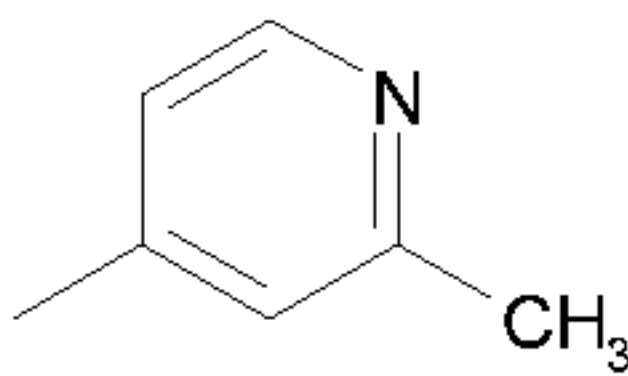
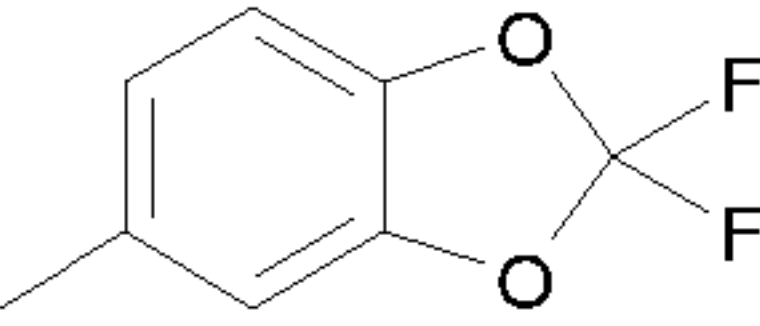
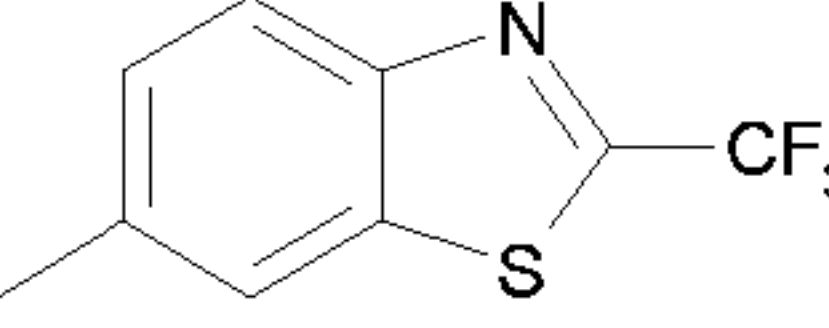
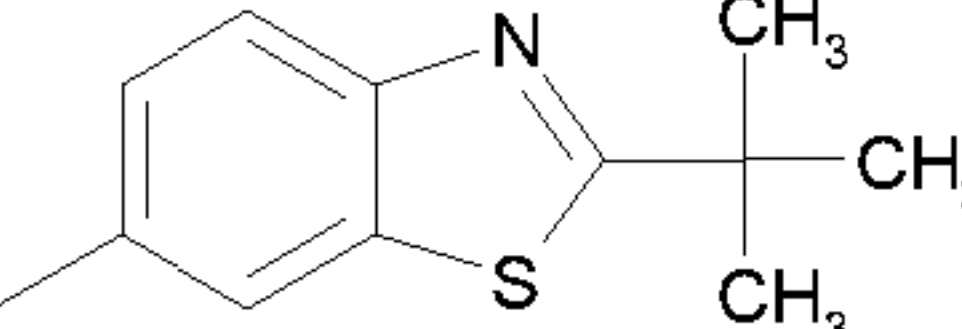
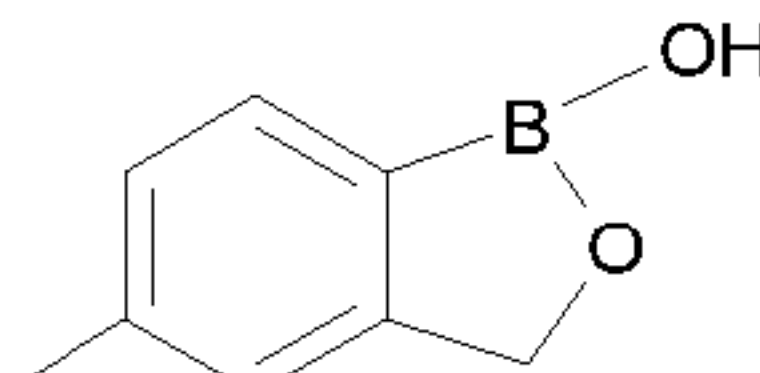
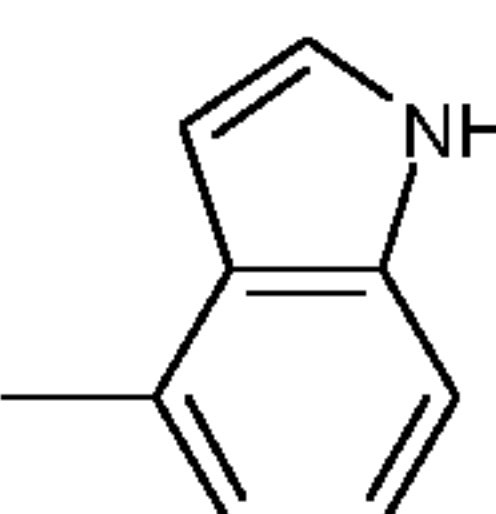
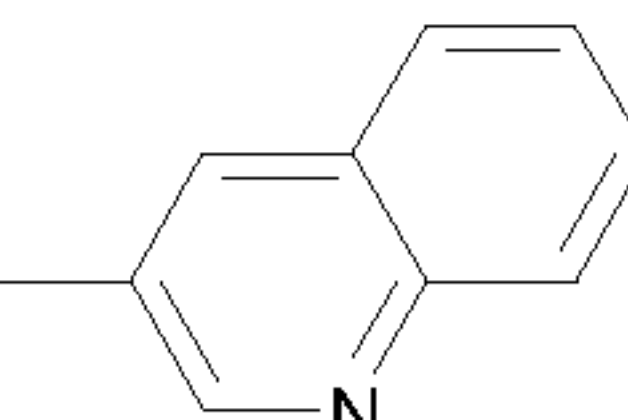
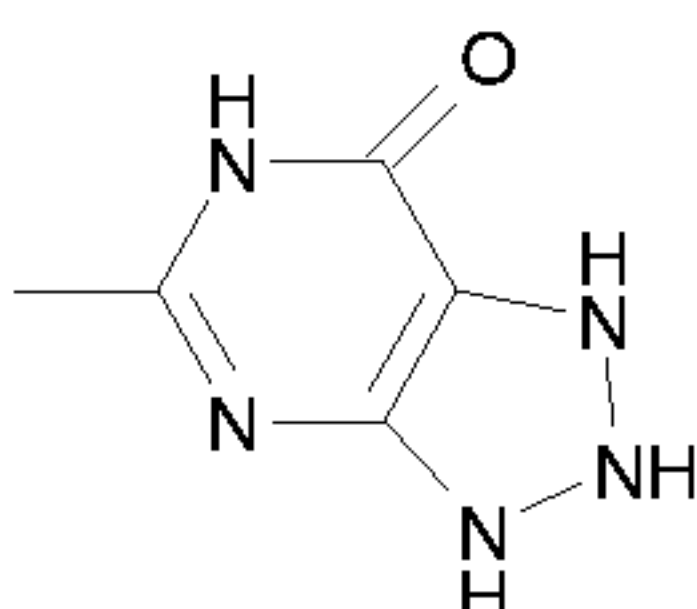
Table 4:

Ex. No.	Y	R ⁰	m/z: [M+H] ⁺	R _t [min] (Method)	R _t [min] (Method B)
4.1		H	503.7	1.94	Powder
4.2		H	447.7	1.99	Solid
4.3		H	482.6	1.94	Solid
4.4		H	495.6	1.76	Solid

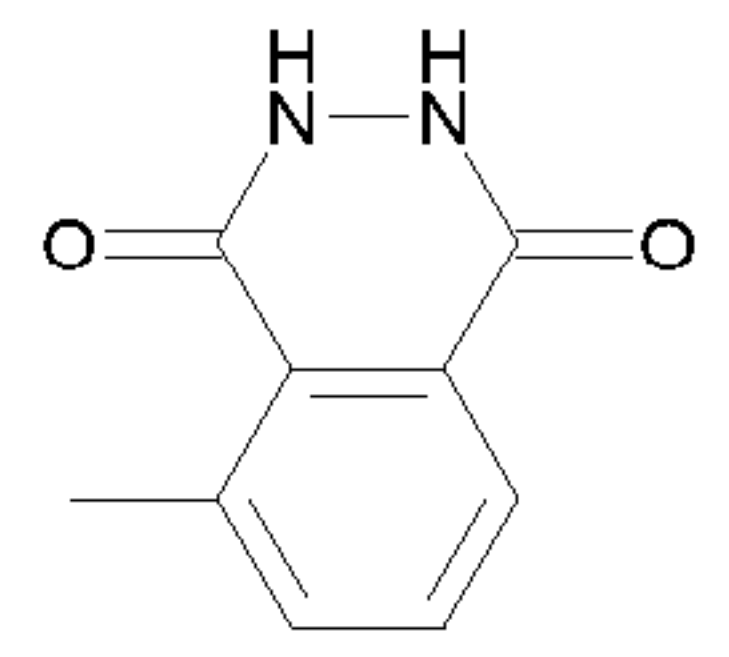
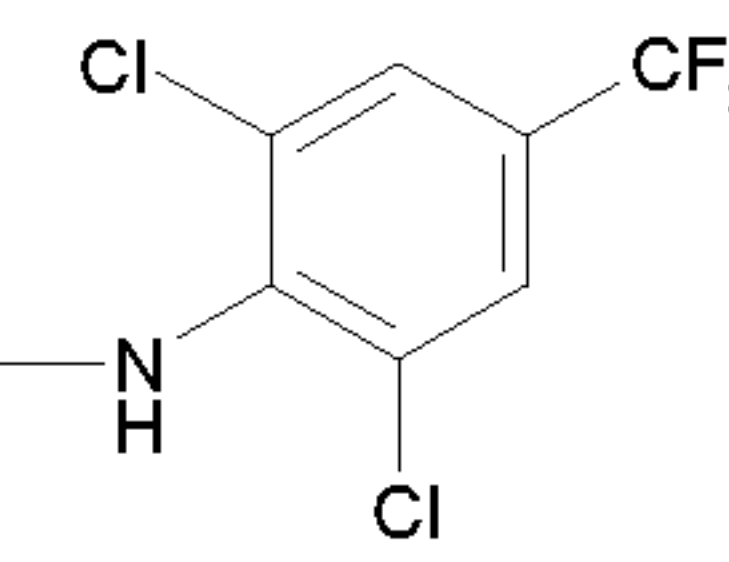
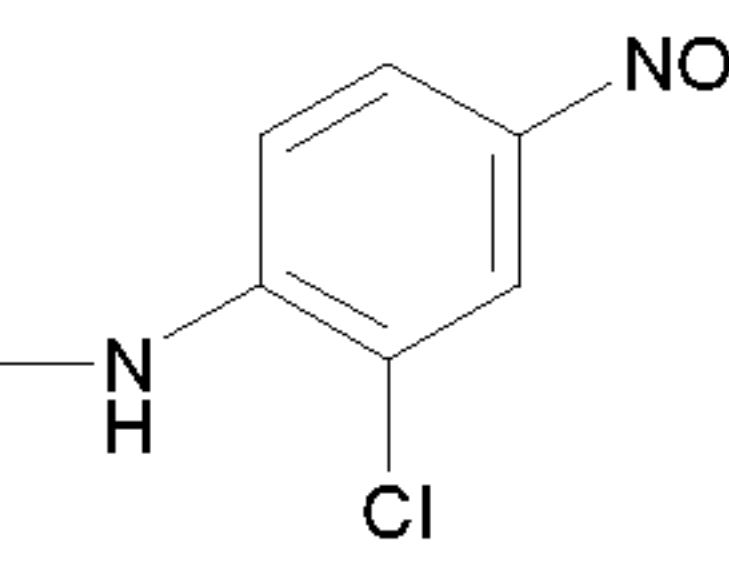
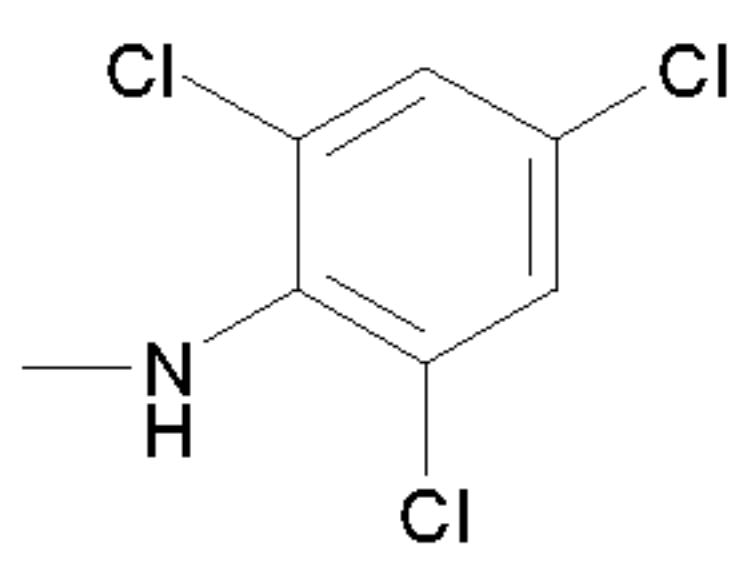
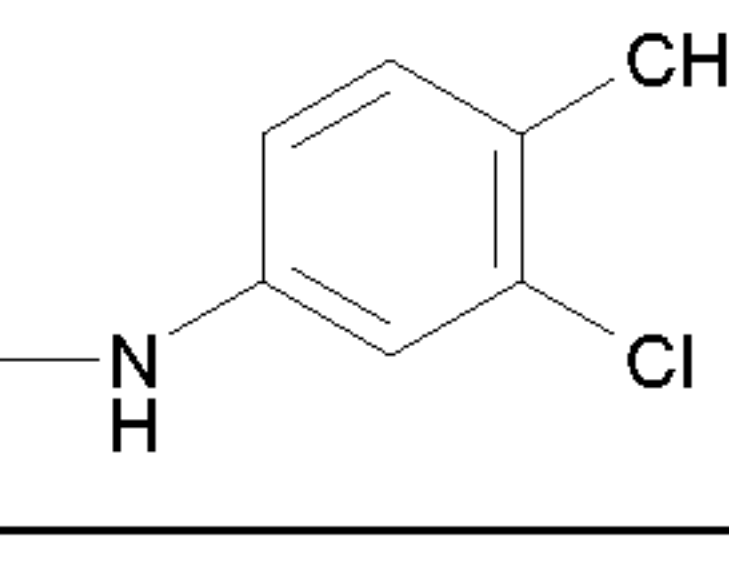
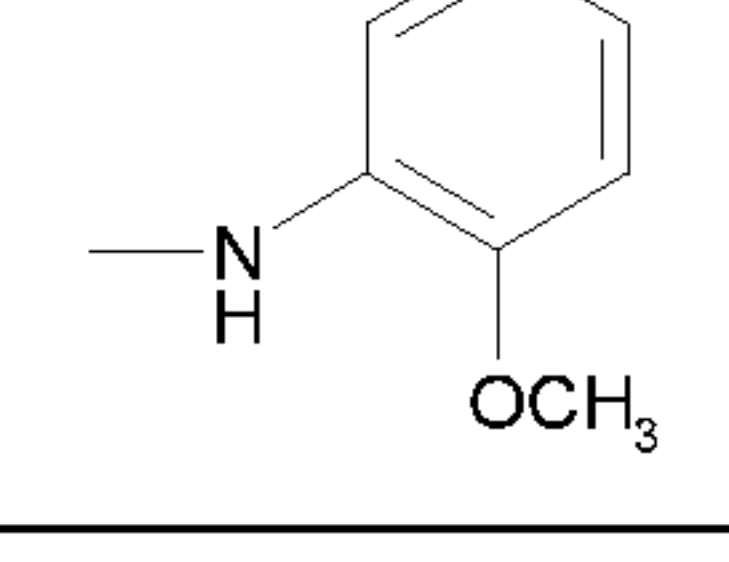
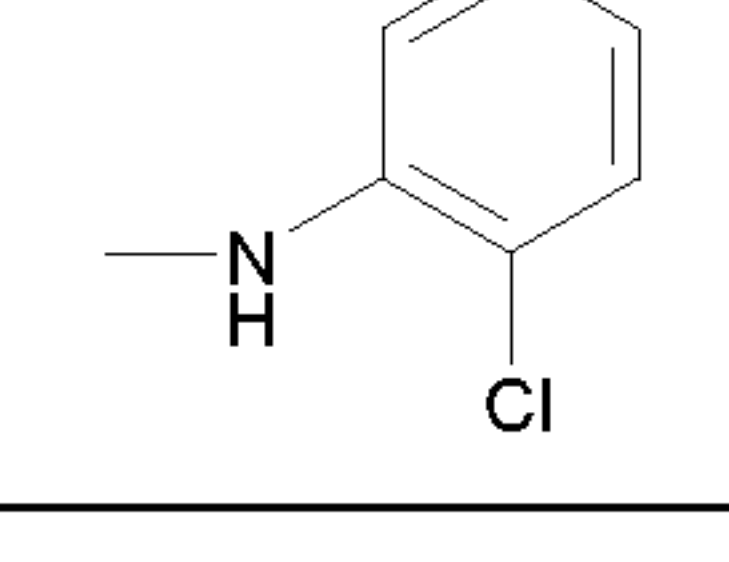
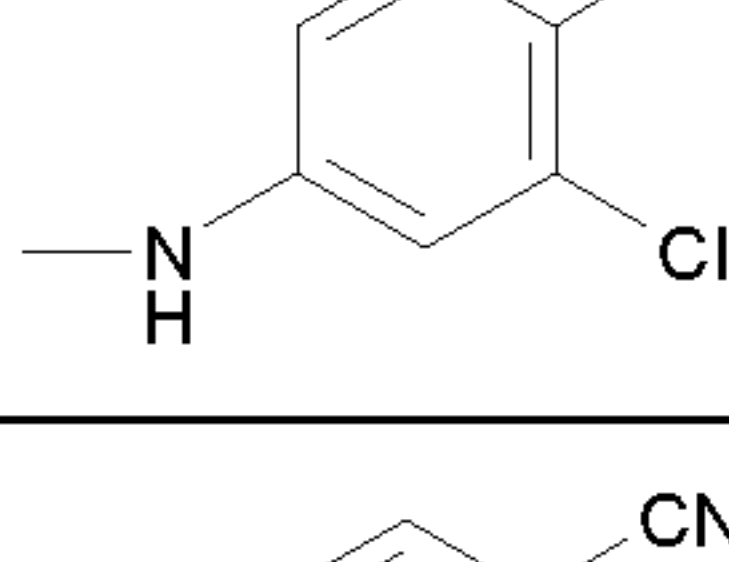
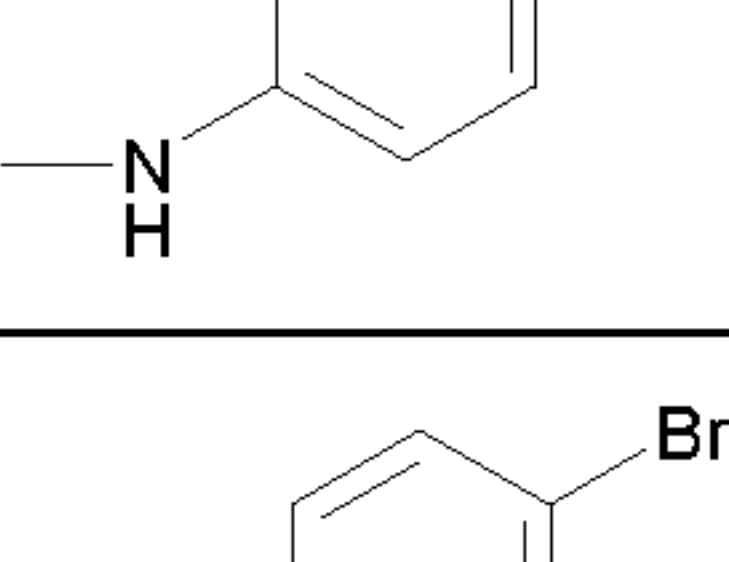
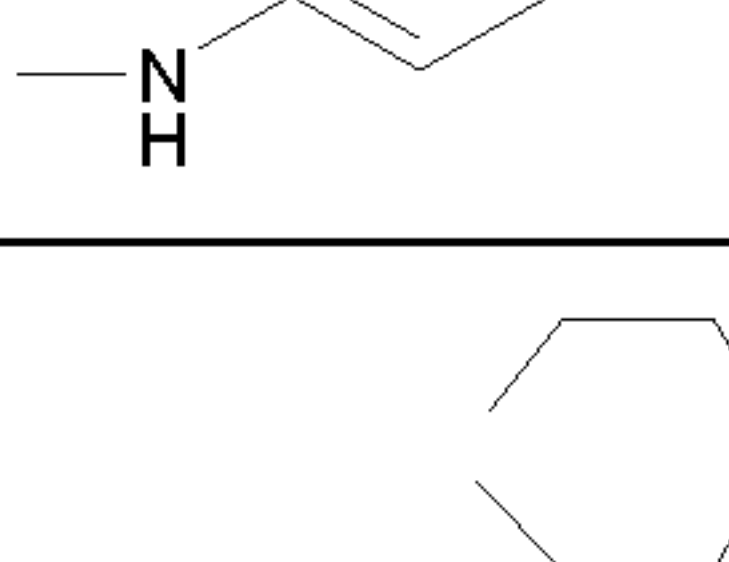
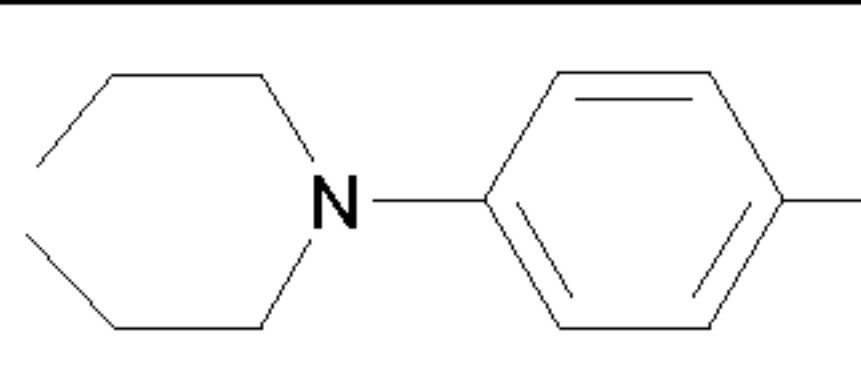
(continued)

Ex. No.	Y	R ⁰	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method B)
4.5		H	423.6	1.69	Solid
4.6		H	468.6	1.79	Powder
4.7		H	492.7	1.83	Solid
4.8		H	487.6	1.99	Solid
4.9		H	509.7	1.95	Solid
4.10		H	608.6	1.85	Solid
4.11		H	508.6	2.32	Solid
4.12		H	563.6.	2.00	Solid
4.13		H	540.5	2.05	Solid
4.14		H	571.7	2.20	Solid
4.15		H	437.7	1.67	Solid
4.16		H	475.6	1.70	Oil
4.17		H	417.8	1.45	Oil

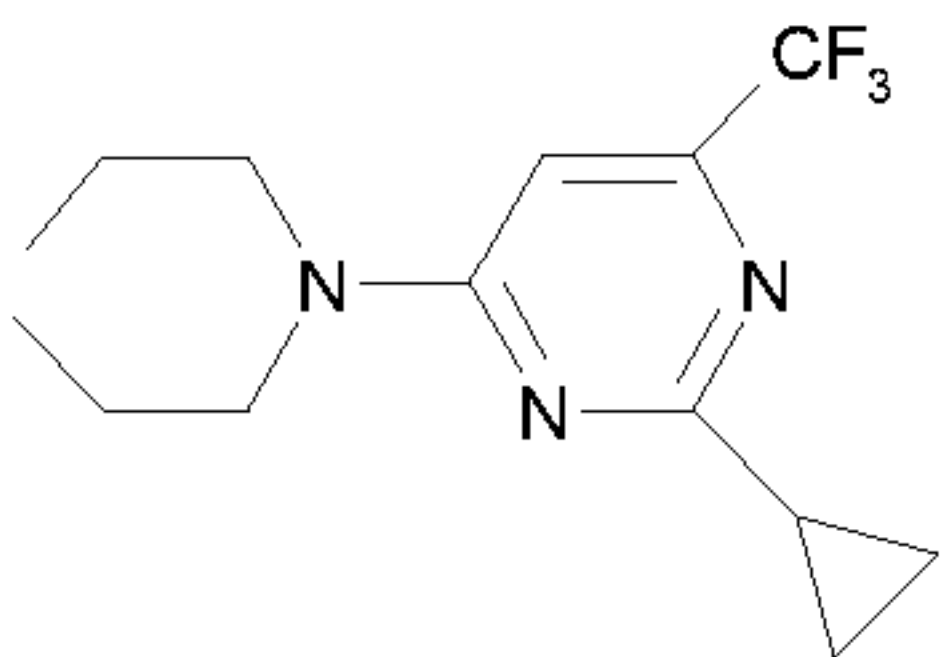
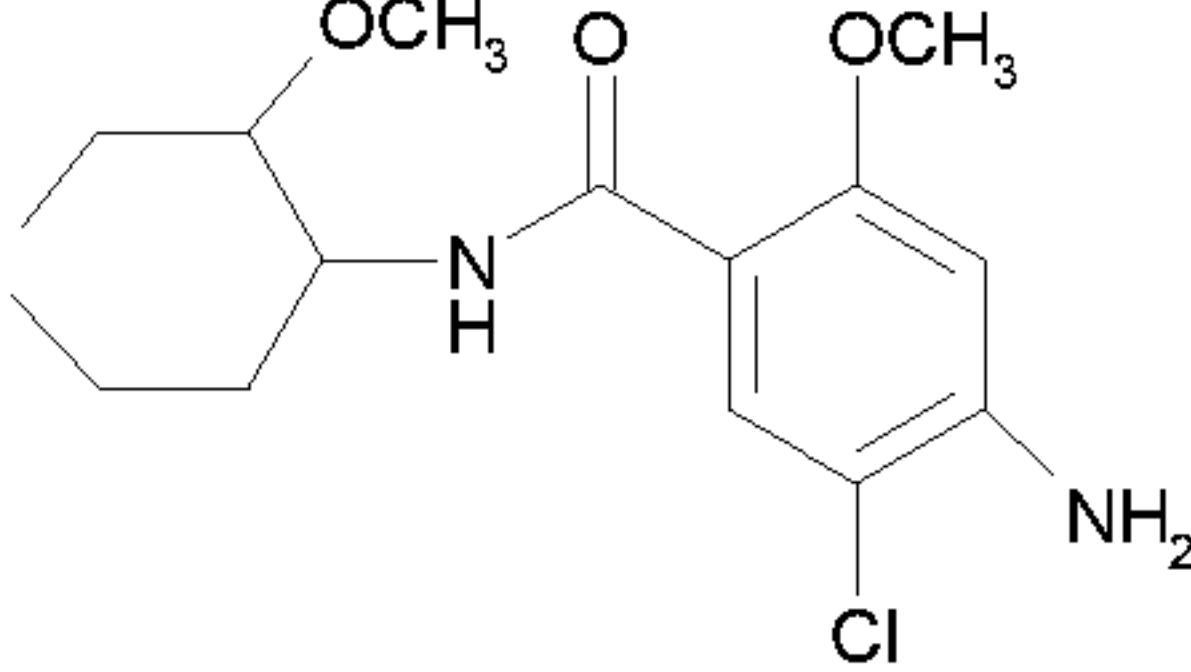
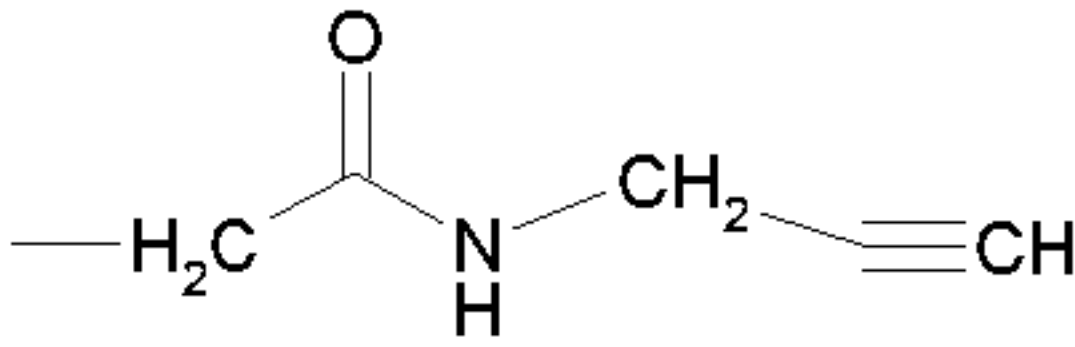
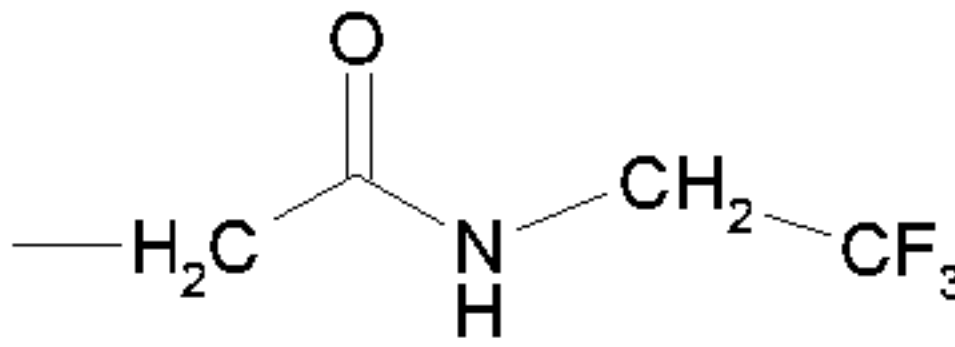
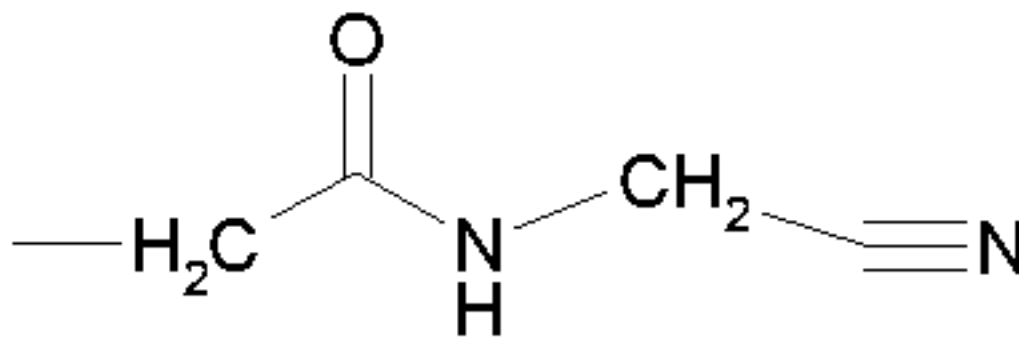
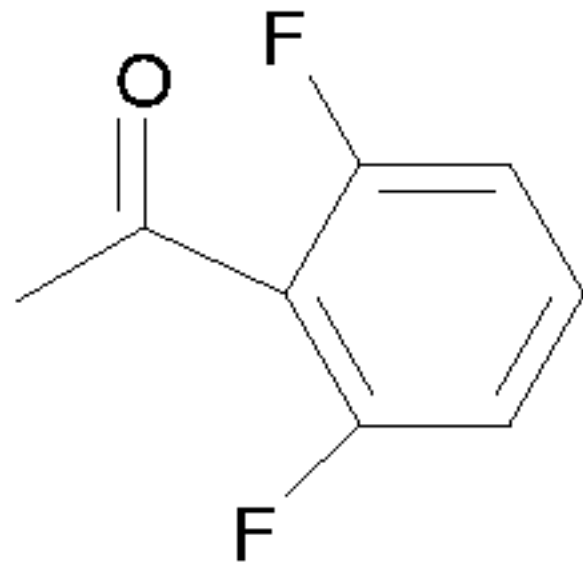
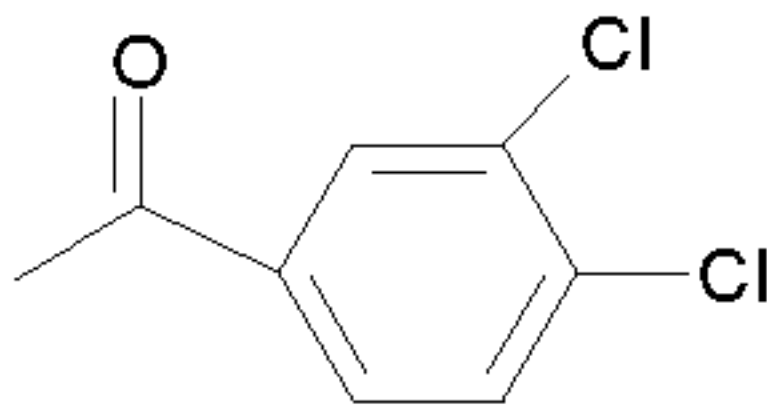
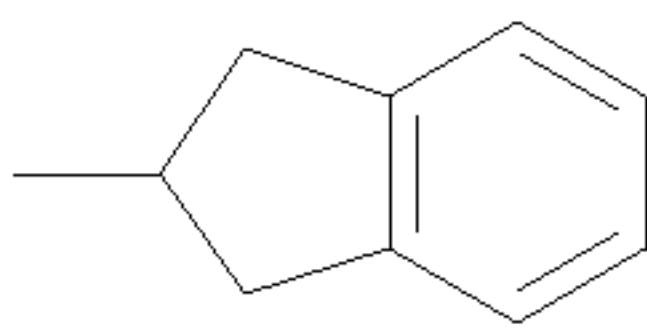
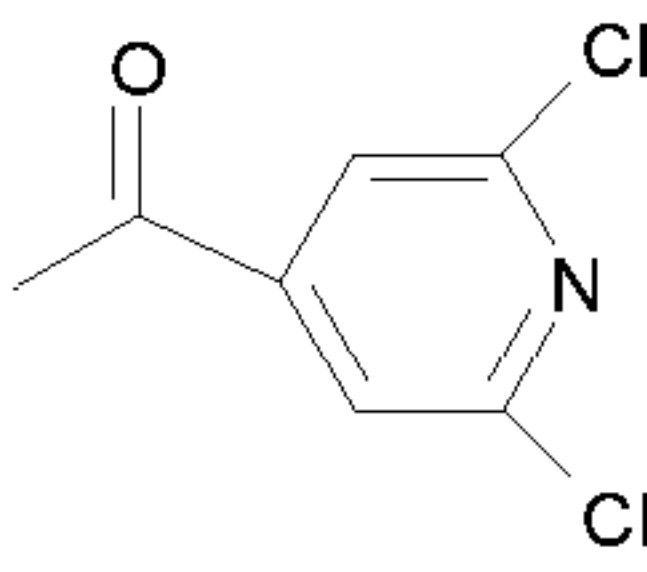
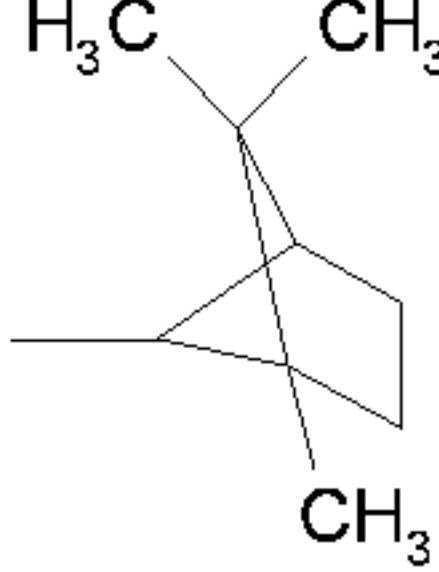
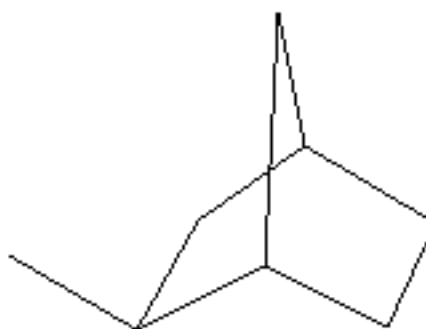
(continued)

Ex. No.	Y	R ⁰	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method B)
4.18		H	447.7	2.20	Oil
4.19		H	465.7	1.47	Oil
4.20		H	451.7	1.71	Oil
4.21		H	485.8	1.90	Oil
4.22		H	431.7	1.25	Powder
4.23		H	496.9	2.06	Foam
4.24		H	541.7	2.07	Solid
4.25		H	543.8	2.09	Solid
4.26		H	472.7	1.62	Solid
4.27		H	455.8	1.71	Solid
4.28		H	467.8	1.73	Solid
4.29		H	475.8	1.51	Solid

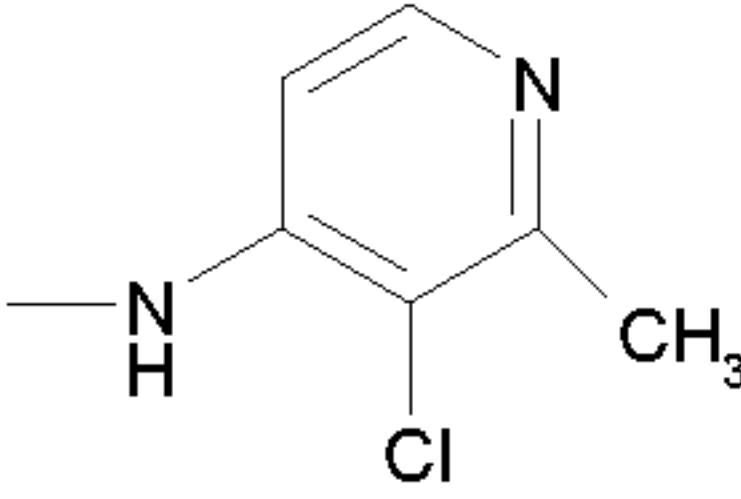
(continued)

Ex. No.	Y	R ⁰	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method B)
4.30		H	500.8	1.77	Solid
4.31		H	567.6	2.08	Solid
4.32		H	510.7	1.78	Solid
4.33		H	533.6	2.09	Oil
4.34		H	479.7	1.89	Powder
4.35		H	461.8	1.78	Oil
4.36		H	465.7	1.82	Oil
4.37		H	499.7	1.89	Oil
4.38		H	456.7	1.65	Oil
4.39		H	509.7	1.75	Oil
4.40			423.7	0.61	Powder
4.41			515.7	1.67	Foam

(continued)

Ex. No.	Y	R ⁰	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method B)
4.42			595.7	1.93	Powder
4.43			636.8	1.62	Solid
4.44		H	435.7	1.48	Solid
4.45		H	479.7	1.56	Solid
4.46		H	436.7	1.46	Solid
4.47		H	480.7	1.74	Oil
4.48		H	512.7	1.85	Solid
4.49		H	456.8	1.95	Resin
4.50		H	513.7	1.76	Solid
4.51		H	477.0	3.09	Foam
4.52		H	434.8	2.02	Oil

(continued)

Ex. No.	Y	R ⁰	m/z: [M+H ⁺]	R _t [min] (Method)	R _t [min] (Method B)
4.53		OH	481.7	3.27	Solid
Biological Testing:					

Gastro-intestinal Larval Development Assay

[0120] Freshly harvested and cleaned nematode eggs are used to seed a suitably formatted well plate containing the test substances to be evaluated for antiparasitic activity and media allowing the full development of eggs through to 3rd instar larvae. The plates are incubated for 6 days at 25°C and 60% relative humidity. Egg-hatching and ensuing larval development are recorded to identify a possible nematocidal activity. Efficacy is expressed in percent reduced egg hatch, reduced development of L3, or paralysis & death of larvae at any stage. Compounds Nos. 1.4, 1.10-1.12, 1.14, 1.16-1.21, 1.23, 1.25-1.26, 1.29-1.33, 2.1, 2.22, 2.28, 2.42-2.43, 3.1-3.2, 4.1, 4.3-4.8, 4.19-4.24, 4.28, 4.32, 4.34, 4.36-4.37, 4.39, 4.42-4.43 and 4.51 reached ≥ 60% efficacy at 10ppm, and are therefore considered active.

Dirofilaria immitis microfilaria assay

[0121] Freshly harvested and cleaned *Dirofilaria immitis* microfilariae are prepared from blood from donor animals dogs. The microfilariae are then distributed in formatted microplates containing the test substances to be evaluated for antiparasitic activity. The plates are incubated for 48 hours at 25°C and 60% relative humidity (RH). Motility of microfilariae is then recorded to determine efficacy. Efficacy is expressed in percent reduced motility as compared to the control and standards. Compounds Nos. 1.2-1.4 and 1.6 to 1.33, 2.1-2.20, 2.22-2.44, 2.46, 3.1-3.4, 4.1-4.10, 4.12-4.16, 4.17-4.18, 4.21-4.29, 4.31-4.39, 4.42 and 4.46-4.52 showed an efficacy above 50% at 10 ppm, and are therefore considered active.

Acanthocheilonema viteae in Gerbil

[0122] Gerbils are artificially infected with 80 L3 larvae of *A. viteae* by subcutaneous injection. Treatment by gavage with the formulated test compounds occurs consecutively day 5 to day 9 after infection. Eighty-four days after infection, gerbils are bled for counting circulating microfilariae, using a Fuchs-Rosenthal counting chamber and microscope. Only test groups with an average of circulating microfilariae at least 50% lower than in the placebo treated group are fully dissected to recover adult worms. Efficacy is expressed as a % reduction in worm numbers in comparison with the placebo treated group, using the Abbot's formula. Compound No. 1.6-1.8, 1.17, 1.25, 1.30, 1.32, 2.24, 4.13, 4.24 showed an efficacy above 80% at 10 mg/kg.

Adult liver fluke-in vitro assay

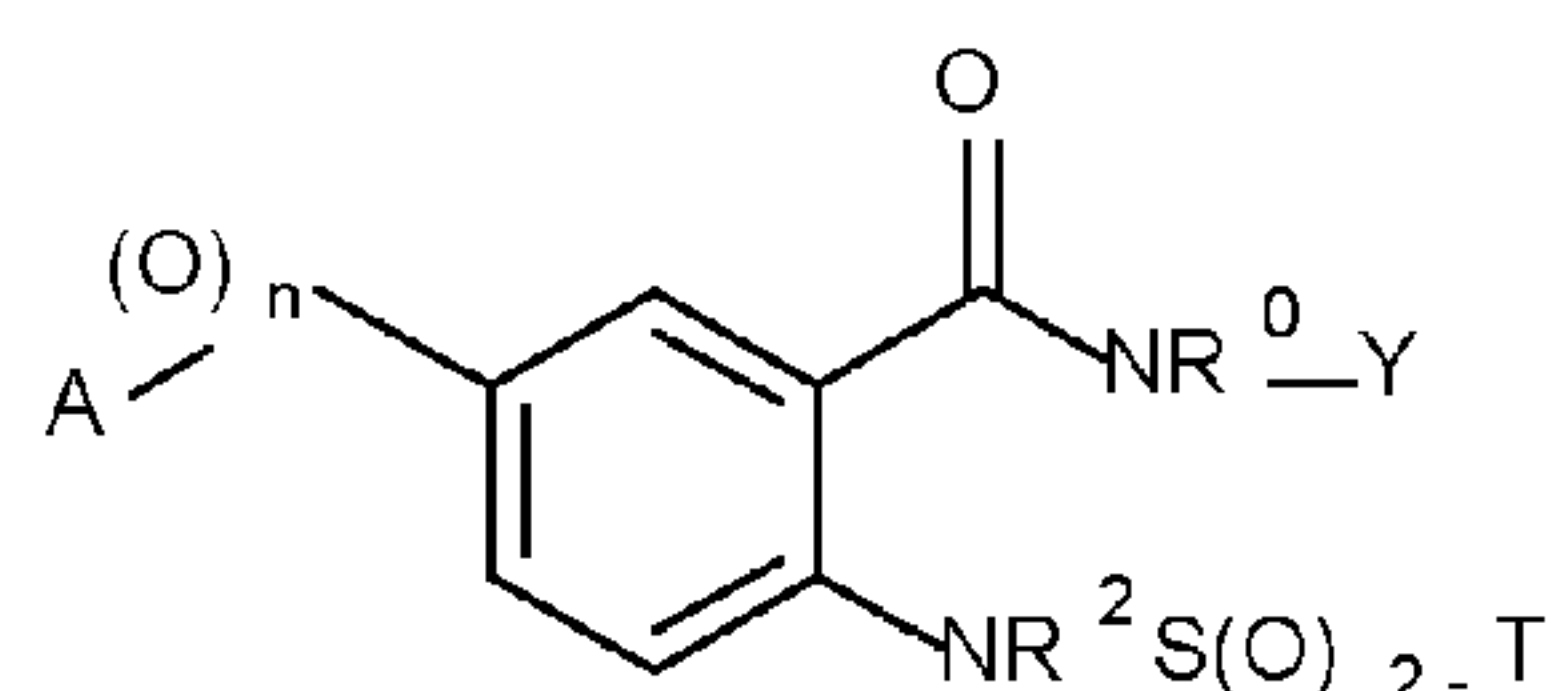
[0123] Freshly harvested adult *Fasciola hepatica* from cattle or sheep livers were distributed in 12-well plates (1 fluke per well) with 4 mL of RPMI complete medium and kept in an incubator at 37°C for approximately 12 hours. After renewal of the medium, the viability of the flukes is determined by video-registration of the movement of the individual flukes (pre-value). Test compounds are added at a concentration of 100 µg/mL and the movements of the flukes are measured after 6 and 24 hours. Efficacy is expressed as percent reduced movement based on the pre-value and the untreated control. In this test the following examples showed more than >90% efficacy after 6 h and >95% after 24 h are considered as positive: 2.2, 4.13.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 3523705 A1 [0004]
- EP 0420804 A2 [0004]
- EP 0420805 A2 [0004]

Patentkrav**1. Forbindelse af formel**

(I),

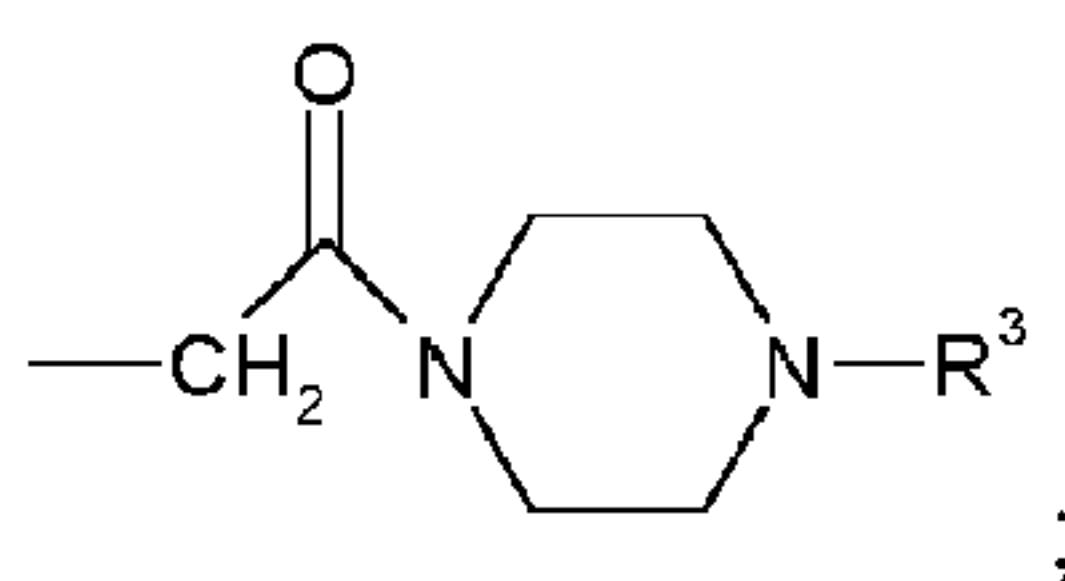
eller et salt eller en enantiomer deraf, hvor

5 n er 1;

A er et phenyl-radikal substitueret af chlor, fluor eller CF_3 ;

R^2 er H eller $-\text{S}(\text{O})_2-\text{T}$;

T er C_1 - C_6 -alkyl som er ikkesubstitueret eller substitueret af halogen, trimethylsilyl, C_3 - C_6 -cycloalkyl, carboxyl eller C_1 - C_4 -alkoxycarbonyl; C_3 - C_6 -cycloalkyl; C_6 - C_{12} -bicarbo-cyclyl; phenyl som er ikkesubstitueret eller substitueret af halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl eller C_1 - C_4 -alkoxy; et 5- eller 6-leddet heteroaromatisk radikal, som er yderligere ikkesubstitueret eller substitueret af halogen, cyano, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl eller C_1 - C_4 -alkoxy; 5- eller 6-leddet heterocycloalkyl med fra 1 til 3 ens eller forskellige heteroatomer valgt fra gruppen bestående af N, O, S og $\text{S}(\text{O})_2$, som er yderligere ikkesubstitueret eller substitueret af C_1 - C_4 -alkyl, C_1 - C_2 -alkoxycarbonyl eller benzyloxycarbonyl ; en gruppe



20

amino; eller N-mono- eller N,N-di- C_1 - C_4 -alkylamino;

R^3 er C_1 - C_4 -alkyl, ikkesubstitueret eller halogen-, C_1 - C_4 -alkyl- eller C_1 - C_4 -haloalkyl-substitueret phenyl, ikkesubstitueret eller halogen-, C_1 - C_4 -alkyl- eller C_1 - C_4 -haloalkyl-substitueret pyridyl, C_1 - C_4 -alkoxycarbonylmethyl eller morpholin-4-yl-carbonylmethyl;

25

R^0 er H eller hydroxy; og

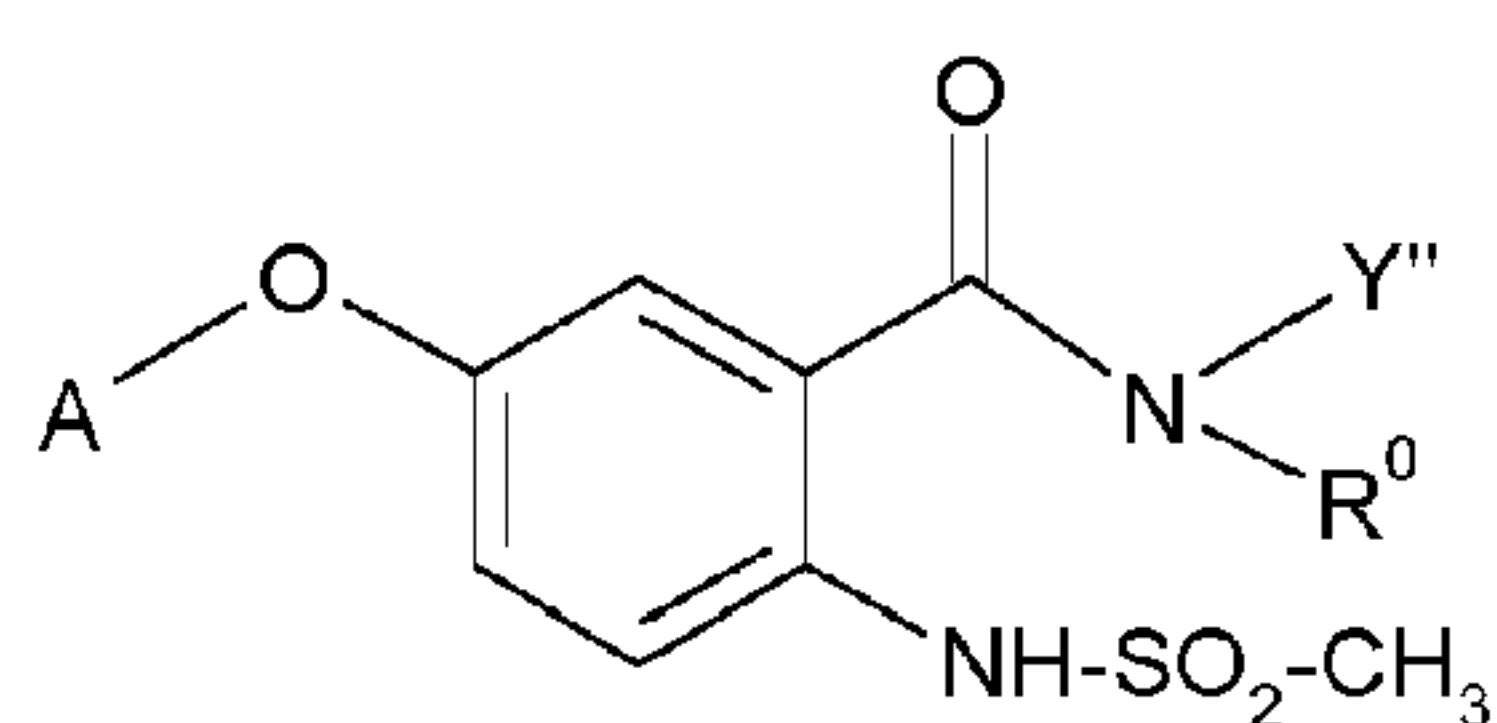
Y er

- 5 (i) phenyl eller et phenylamino, som er substitueret af et eller flere ens eller forskellige radikaler valgt fra gruppen bestående af halogen; C₁-C₂-alkyl; C₁-C₃-haloalkyl; C₁-C₂-alkoxy; C₁-C₃-haloalkoxy; C₁-C₂-haloalkylthio; SF₅; cyano; nitro; hydroxy; eller methylsulfonylamino; eller er
- 10 (ii) 5- eller 6-leddet heteroaryl eller heteroarylamino, som er hver yderligere ikkesubstitueret eller substitueret af halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxycarbonyl, C₂-C₄-alkanoyl, eller phenyl eller phenylsulfonyl som er hver ikkesubstitueret eller substitueret af halogen, cyano, nitro, methyl eller methoxy; eller er
- 15 (iii) benzoyl eller 5- eller 6-leddet heteroarylcarbonyl, som er hver yderligere ikkesubstitueret eller substitueret af halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxycarbonyl, C₂-C₄-alkanoyl eller phenyl; eller er
- (iv) et C₆-C₁₂-bicarbocyklisk radikal; eller er
- 20 (v) et hetero-bicyklisk ringradikal omfattende i alt 8 til 10 ringled, fra hvilke 1 til 5 led er ens eller forskellige heteroatomer valgt fra gruppen bestående af B, N, O og S, og fra hvilke 0 til 2 led er en gruppe -C(O)-, hvilken bicyklisk ringradikal er yderligere ikkesubstitueret eller substitueret af halogen, cyano, hydroxyl, C₁-C₄-alkoxy, C₁-C₄-alkyl eller C₁-C₄-haloalkyl; eller er
- (vi) et radikal -H₂C-C(O)-NH-R⁴, hvor R⁴ er C₁-C₄-haloalkyl, C₂-C₃-alkynyl eller cyano-C₁-C₄-alkyl; eller
- 25 R⁰ og Y sammen med N-atomet, til hvilket de er fastgjort, danner et piperidiny- eller piperaziny-radikal som er substitueret af C₁-C₄-alkyl, C₁-C₄-alkoxy, ikkesubstitueret eller halogen-, C₁-C₄-alkyl-, C₁-C₄-haloalkyl-, amino- og/eller C₁-C₄-alkoxy-substitueret phenyl eller benzoylamino, eller ikkesubstitueret eller C₁-C₄-alkyl-, C₁-C₄-haloalkyl-, C₃-C₆-cycloalkyl- eller
- 30 halogen-substitueret pyridyl eller pyrimidiny; under forudsætning af det forbehold at mindst én af A og Y ikke må være et phenyl-radikal, hvis T er CH₃.

2. Forbindelse ifølge krav 1, hvor A er phenyl, som er monosubstitueret af chlor, fluor eller CF₃, Y er phenyl som er substitueret af 2 eller 3 ens eller forskellige radikaler valgt fra halogen eller CF₃, og T er C₂-C₄-alkyl, som er ikkesubstitueret eller substitueret af halogen, cyclopropyl, cyclohexyl, trimethylsilyl, carboxy eller C₁-C₂-alkoxycarbonyl; cyclopropyl eller cyclohexyl; radikalet af (+)- eller (-)-camphor; phenyl som er ikkesubstitueret eller substitueret af fluor, chlor, methyl, methoxy, CF₃ eller nitro; eller pyridyl, thienyl eller pyrimidinyl; piperidinyl, piperazinyl, tetrahydropyranyl, morpholinyl, thiomorpholinyl eller thiomorpholin-4-yl-1,1-dioxid, som er hver ikkesubstitueret eller substitueret af methyl.

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3. Forbindelse ifølge krav 1 af formel



(Ic),

hvor A er phenyl som er substitueret som defineret i krav 1;

R⁰ er H eller hydroxy; og

15 Y'' er

- (i) 5- eller 6-leddet heteroaryl eller heteroarylamino, som er hver yderligere ikkesubstitueret eller substitueret af halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkanoyl, eller phenyl eller phenylsulfonyl som er hver ikkesubstitueret eller substitueret af halogen, cyano, nitro, methyl eller methoxy; eller er
- (ii) benzoyl eller 5- eller 6-leddet heteroarylcarbonyl, som er hver yderligere ikkesubstitueret eller substitueret af halogen, cyano, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkanoyl eller phenyl; eller er
- (iii) et C₆-C₁₂-bicarbocyklisk radikal; eller er
- (iv) et hetero-bicyklisk ringradikal omfattende i alt 8 til 10 ringled, fra hvilke 1 til 5 er ens eller forskellige heteroatomer valgt fra gruppen bestående af B, N, O og S, og fra hvilke 0 til 2 er en gruppe -C(O)-, hvilket bicyklisk ringradikal er yderligere ikkesubstitueret eller substitueret af

halogen, cyano, hydroxyl, C₁-C₄-alkoxy, C₁-C₄-alkyl eller C₁-C₄-haloalkyl;
eller er

(v) et radikal -H₂C-C(O)-NH-R⁴, hvor R⁴ er C₁-C₄-haloalkyl, C₂-C₃-alkynyl
eller cyano-C₁-C₄-alkyl; eller

- 5 R⁰ og Y" sammen med N-atomet, til hvilket de er fastgjort, danner et
piperidiny- eller piperaziny-radikal som er substitueret af C₁-C₄-alkyl, C₁-
C₄-alkoxy ikkesubstitueret eller halogen-, C₁-C₄-alkyl-, halo- C₁-C₄-alkyl-,
amino- og/eller C₁-C₄-alkoxy-substitueret phenyl eller benzoylamino, eller
10 ikkesubstitueret eller C₁-C₄-alkyl-, C₁-C₄-haloalkyl-, C₃-C₆-cycloalkyl- eller
halogen-substitueret pyridyl eller pyrimidinyl.

4. Forbindelse ifølge krav 3, hvor

A er phenyl som er monosubstitueret af chlor, fluor eller CF₃;

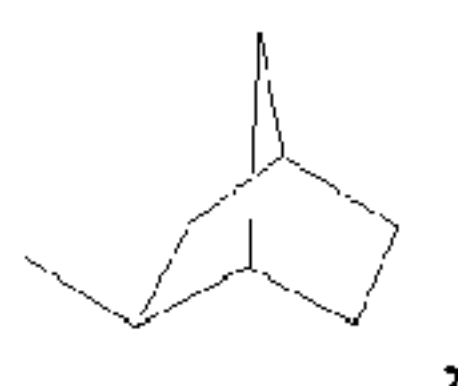
R⁰ er H, og

15 Y" er

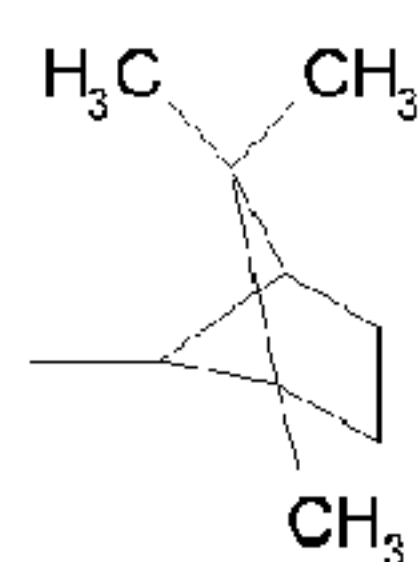
- (i) 2-, 3- eller 4-pyridyl som er ikkesubstitueret eller substitueret af
halogen, C₁-C₄-alkyl eller C₁-C₂-alkoxy; 2-thienyl som er ikkesubstitueret
eller substitueret af C₁-C₂-alkyl, C₁-C₂-alkoxycarbonyl; 2-thiazolyl som er
20 ikkesubstitueret eller substitueret af halogen, cyano, nitro, C₁-C₂-alkyl, C₁-
C₂-haloalkyl, C₁-C₂-alkoxycarbonyl, eller phenyl eller phenylsulfonyl som er
til gengæld hver ikkesubstitueret eller substitueret af halogen, cyano, nitro
eller methyl; 5-isothiazoyl som er ikkesubstitueret eller substitueret af
halogen eller methyl; 2-oxazolyl, som er ikkesubstitueret eller substitueret
af C₁-C₂-alkyl eller C₁-C₂-haloalkyl; eller 1,3,4-thiadiazol-5-yl, som er
25 ikkesubstitueret eller substitueret af C₁-C₂-alkyl eller C₁-C₂-haloalkyl; 2-, 3-
eller 4-pyridylamino, som er ikkesubstitueret eller substitueret af halogen,
C₁-C₄-alkyl eller C₁-C₂-alkoxy; eller

- (ii) benzoyl som er ikkesubstitueret eller substitueret af halogen, eller 2-,
3- eller 4-pyridylcarbonyl som er ikkesubstitueret eller substitueret af
30 halogen eller C₁-C₄-alkyl; eller

(iii) et radikal



et radikal



eller indanyl; eller

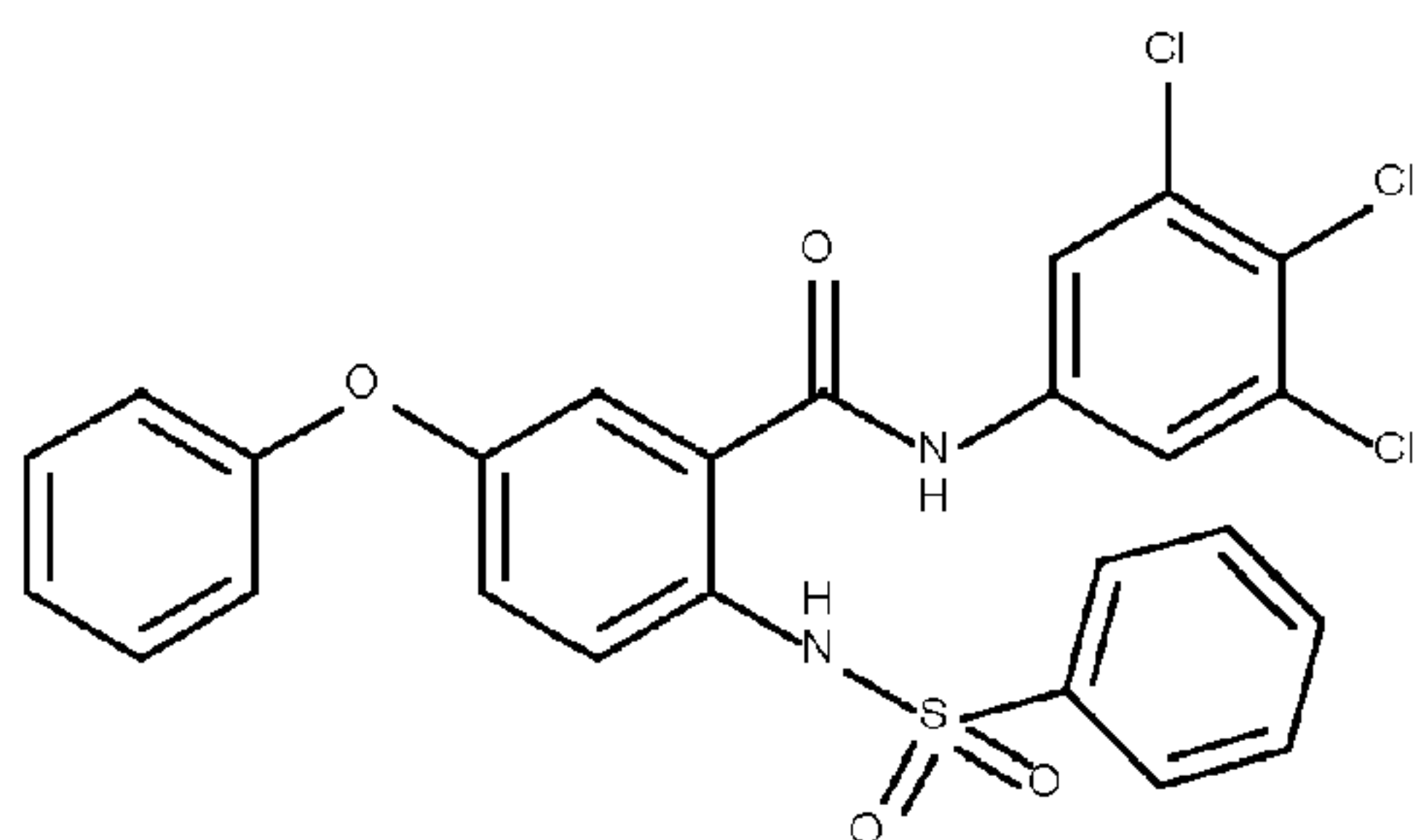
- (iv) benzothiazolyl, indolyl, quinolyl, methylenedioxyphenyl, benzooxaboronyl, triazolopyrimidinonyl eller phthalhydrazidyl, som er hver
 5 ikke-substitueret eller substitueret af halogen, C₁-C₄-alkyl, C₁-C₂-haloalkyl eller hydroxy; eller

(v) et radikal -H₂C-C(O)-NH-CH₂-C≡CH, -H₂C-C(O)-NH-CH₂-CN eller -H₂C-C(O)-NH-CH₂-CF₃;

- 10 eller R⁰ og Y" sammen med N-atomet, til hvilket de er fastgjort, danner et piperidiny- eller piperaziny-radikal, som er substitueret af methyl; methoxy; halogen-, amino-, methoxy- eller trifluormethyl-substitueret phenyl eller benzoylamino; eller halogen-, trifluormethyl- og/eller cyclopropyl-substitueret pyridyl eller pyrimidinyl.

15

5. Forbindelse af formelen:



- 20 **6.** Sammensætning til bekæmpelsen af parasitter, som indeholder som aktiv ingrediens mindst én forbindelse ifølge et hvilket som helst af kravene 1 til 5, udover bærere og/eller dispergeringsmidler.

- 7.** Forbindelse ifølge et hvilket som helst af kravene 1 til 5 til anvendelse i
 25 bekæmpelsen af endoparasitter i eller på varmblodede dyr.