

**NEW PYRROLE COMPOUNDS, A PROCESS FOR THEIR PREPARATION
AND PHARMACEUTICAL COMPOSITIONS CONTAINING THEM**

The present invention relates to new pyrrole compounds, to a process for their preparation and to pharmaceutical compositions containing them.

The compounds of the present invention are new and have very valuable pharmacological characteristics in the field of apoptosis and cancerology.

5 Apoptosis, or programmed cell death, is a physiological process that is crucial for embryonic development and maintenance of tissue homeostasis.

Apoptotic-type cell death involves morphological changes such as condensation of the nucleus, DNA fragmentation and also biochemical phenomena such as the activation of caspases which cause damage to key structural components of the cell, so inducing its
10 disassembly and death. Regulation of the process of apoptosis is complex and involves the activation or repression of several intracellular signalling pathways (Cory S. *et al.*, Nature Review Cancer, 2002, 2, 647-656).

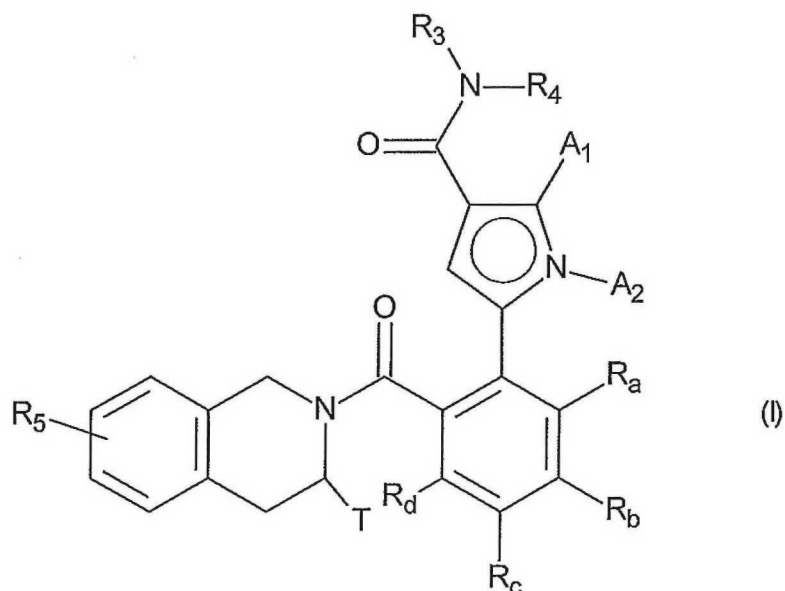
Deregulation of apoptosis is involved in certain pathologies. Increased apoptosis is associated with neurodegenerative diseases such as Parkinson's disease, Alzheimer's
15 disease and ischaemia. Conversely, deficits in the implementation of apoptosis play a significant role in the development of cancers and their chemoresistance, in auto-immune diseases, inflammatory diseases and viral infections. Accordingly, absence of apoptosis is one of the phenotypic signatures of cancer (Hanahan D. *et al.*, Cell 2000, 100, 57-70).

The anti-apoptotic proteins of the Bcl-2 family are associated with numerous pathologies.
20 The involvement of proteins of the Bcl-2 family is described in numerous types of cancer, such as colorectal cancer, breast cancer, small-cell lung cancer, non-small-cell lung cancer, bladder cancer, ovarian cancer, prostate cancer, chronic lymphoid leukaemia, follicular lymphoma, myeloma, etc. Overexpression of the anti-apoptotic proteins of the Bcl-2 family is involved in tumorigenesis, in resistance to chemotherapy and in the clinical
25 prognosis of patients affected by cancer. There is, therefore, a therapeutic need for compounds that inhibit the anti-apoptotic activity of the proteins of the Bcl-2 family.

In addition to being new, the compounds of the present invention have pro-apoptotic properties making it possible to use them in pathologies involving a defect in apoptosis,

such as, for example, in the treatment of cancer, auto-immune diseases and diseases of the immune system.

The present invention relates more especially to compounds of formula (I):



wherein:

- 5 ♦ A₁ and A₂, each independently of the other, represent a hydrogen or halogen atom, a linear or branched (C₁-C₆)polyhaloalkyl group, a linear or branched (C₁-C₆)alkyl group or a cycloalkyl group,
- ♦ T represents a hydrogen atom, a linear or branched (C₁-C₆)alkyl group optionally substituted by from one to three halogen atoms, a group (C₁-C₄)alkyl-NR₁R₂, or a
10 group (C₁-C₄)alkyl-OR₆,
- ♦ R₁ and R₂, each independently of the other, represent a hydrogen atom or a linear or branched (C₁-C₆)alkyl group, or R₁ and R₂ form with the nitrogen atom carrying them a heterocycloalkyl,
- 15 ♦ R₃ represents a linear or branched (C₁-C₆)alkyl group, a linear or branched (C₂-C₆)alkenyl group, a linear or branched (C₂-C₆)alkynyl group, a cycloalkyl group, a (C₃-C₁₀)cycloalkyl-(C₁-C₆)alkyl group wherein the alkyl moiety is linear or branched, a heterocycloalkyl group, an aryl group or a heteroaryl group, it being

understood that one or more of the carbon atoms of the preceding groups, or of their possible substituents, may be deuterated,

- ♦ R_4 represents an aryl group, a heteroaryl group, a cycloalkyl group or a linear or branched (C_1-C_6) alkyl group, it being understood that one or more of the carbon atoms of the preceding groups, or of their possible substituents, may be deuterated,
- ♦ R_5 represents a hydrogen or halogen atom, a linear or branched (C_1-C_6) alkyl group, or a linear or branched (C_1-C_6) alkoxy group,
- ♦ R_6 represents a hydrogen atom or a linear or branched (C_1-C_6) alkyl group,
- ♦ R_a, R_b, R_c and R_d , each independently of the others, represent R_7 , a halogen atom, a linear or branched (C_1-C_6) alkoxy group, a hydroxy group, a linear or branched (C_1-C_6) polyhaloalkyl group, a trifluoromethoxy group, $-NR_7R_7'$, nitro, $R_7-CO-(C_0-C_6)alkyl-$, $R_7-CO-NH-(C_0-C_6)alkyl-$, $NR_7R_7'-CO-(C_0-C_6)alkyl-$, $NR_7R_7'-CO-(C_0-C_6)alkyl-O-$, $R_7-SO_2-NH-(C_0-C_6)alkyl-$, $R_7-NH-CO-NH-(C_0-C_6)alkyl-$, $R_7-O-CO-NH-(C_0-C_6)alkyl-$, a heterocycloalkyl group, or the substituents of one of the pairs (R_a, R_b) , (R_b, R_c) or (R_c, R_d) form together with the carbon atoms carrying them a ring composed of from 5 to 7 ring members, which may contain from one to 2 hetero atoms selected from oxygen and sulphur, it also being understood that one or more carbon atoms of the ring defined hereinbefore may be deuterated or substituted by from one to 3 groups selected from halogen and linear or branched $(C_1-C_6)alkyl$,
- ♦ R_7 and R_7' , each independently of the other, represent a hydrogen, a linear or branched $(C_1-C_6)alkyl$, a linear or branched $(C_2-C_6)alkenyl$, a linear or branched $(C_2-C_6)alkynyl$, an aryl or a heteroaryl, or R_7 and R_7' , together with the nitrogen atom carrying them, form a heterocycle composed of from 5 to 7 ring members,

it being understood that:

- "aryl" means a phenyl, naphthyl, biphenyl or indenyl group,
- "heteroaryl" means any mono- or bi-cyclic group composed of from 5 to 10 ring members, having at least one aromatic moiety and containing from 1 to 4 hetero atoms selected from oxygen, sulphur and nitrogen (including quaternary nitrogens),
- "cycloalkyl" means any mono- or bi-cyclic, non-aromatic, carbocyclic group containing from 3 to 10 ring members,

- "heterocycloalkyl" means any mono- or bi-cyclic, non-aromatic, condensed or spiro group composed of from 3 to 10 ring members and containing from 1 to 3 hetero atoms selected from oxygen, sulphur, SO, SO₂ and nitrogen,

it being possible for the aryl, heteroaryl, cycloalkyl and heterocycloalkyl groups so defined and the groups alkyl, alkenyl, alkynyl and alkoxy to be substituted by from 1 to 3 groups selected from optionally substituted, linear or branched (C₁-C₆)alkyl, (C₃-C₆)spiro, optionally substituted, linear or branched (C₁-C₆)alkoxy, (C₁-C₆)alkyl-S-, hydroxy, oxo (or *N*-oxide where appropriate), nitro, cyano, -COOR', -OCOR', NR'R'', linear or branched (C₁-C₆)polyhaloalkyl, trifluoromethoxy, (C₁-C₆)alkylsulphonyl, halogen, optionally substituted aryl, heteroaryl, aryloxy, arylthio, cycloalkyl, heterocycloalkyl optionally substituted by one or more halogen atoms or alkyl groups, it being understood that R' and R'', each independently of the other, represent a hydrogen atom or an optionally substituted, linear or branched (C₁-C₆)alkyl group,

to their enantiomers and diastereoisomers, and to addition salts thereof with a pharmaceutically acceptable acid or base.

Among the pharmaceutically acceptable acids there may be mentioned, without implying any limitation, hydrochloric acid, hydrobromic acid, sulphuric acid, phosphonic acid, acetic acid, trifluoroacetic acid, lactic acid, pyruvic acid, malonic acid, succinic acid, glutaric acid, fumaric acid, tartaric acid, maleic acid, citric acid, ascorbic acid, oxalic acid, methanesulphonic acid, camphoric acid etc.

Among the pharmaceutically acceptable bases there may be mentioned, without implying any limitation, sodium hydroxide, potassium hydroxide, triethylamine, *tert*-butylamine etc.

Advantageously, A₁ represents a hydrogen atom or a methyl group.

Furthermore, A₂ preferably represents a linear or branched (C₁-C₆)alkyl group optionally substituted by a group selected from halogen, hydroxy, linear or branched (C₁-C₆)alkoxy, NR'R'' and morpholine.

In another embodiment of the invention, A₂ represents a linear or branched (C₁-C₆)polyhaloalkyl group or a cyclopropyl group.

Even more preferably, A₁ and A₂ both represent a methyl group.

In a preferred embodiment of the invention, T represents a linear or branched (C₁-C₆)alkyl. In another preferred embodiment, T represents a group alkyl(C₁-C₄)-NR₁R₂, and more particularly a group alkyl(C₁-C₄)-NR₁R₂ wherein R₁ and R₂ form with the nitrogen atom carrying them a heterocycloalkyl.

In preferred compounds of the invention, T represents a methyl, aminomethyl, (morpholin-4-yl)methyl, (4-methylpipérazin-1-yl)methyl, 2-(morpholin-4-yl)ethyl, [2-(morpholin-4-yl)ethoxy]methyl, hydroxymethyl, [2-(dimethylamino)ethoxy]methyl, hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl, 1-oxa-6-azaspiro[3.3]hept-6-ylmethyl, 3-(morpholin-4-yl)propyl or trifluoromethyl group. Even more preferably, T represents a (morpholin-4-yl)methyl, methyl or 3-(morpholin-4-yl)propyl group.

Preferably, R_a and R_d each represent a hydrogen atom and (R_b,R_c), together with the carbon atoms carrying them, form a 1,3-dioxolane group or a 1,4-dioxane group; or R_a, R_c and R_d each represent a hydrogen atom and R_b represents a hydrogen or halogen atom or a methoxy group. Even more preferably, R_a and R_d each represent a hydrogen atom and (R_b,R_c), together with the carbon atoms carrying them, form a 1,3-dioxolane group; or R_a, R_c and R_d each represent a hydrogen atom and R_b represents a halogen, preferably a chlorine or fluorine atom.

In another embodiment of the invention, R_a and R_d each represent a hydrogen atom, R_b represents a hydrogen or halogen atom and R_c a hydroxy or methoxy group, or: R_a and R_d each represent a hydrogen atom, R_b represents a hydroxy or methoxy group and R_c a halogen atom.

Alternatively, R_a, R_b and R_d advantageously each represent a hydrogen atom and R_c represents a group selected from R₇-CO-NH-(C₀-C₆)alkyl-, R₇-SO₂-NH-(C₀-C₆)alkyl-, R₇-

NH-CO-NH-(C₀-C₆)alkyl- and R₇-O-CO-NH-(C₀-C₆)alkyl-. For those specific compounds, R₃ preferably represents a linear or branched (C₁-C₆)alkyl or a heteroaryl optionally substituted by a linear or branched (C₁-C₆)alkyl, and R₄ represents a 4-hydroxyphenyl group. Even more preferably, R₃ represents a methyl.

- 5 Preferred R₄ groups are as follows: phenyl; 4-hydroxyphenyl; 3-fluoro-4-hydroxyphenyl; 2-hydroxypyrimidine; 3-hydroxypyridine. Even more preferably, R₄ represents a 4-hydroxyphenyl group.

In preferred compounds of the invention, R₃ represents a linear or branched (C₁-C₆)alkyl group (preferably methyl), aryl or heteroaryl, all being optionally substituted. The groups
10 aryl and heteroaryl are more especially preferred. Finally, R₃ preferably represents a group selected from phenyl, 1*H*-pyrazole, 1*H*-indole, 1*H*-indazole, pyridine, pyrimidine, 1*H*-pyrrolo[2,3-*b*]pyridine, 2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridine, 1*H*-benzimidazole, 1*H*-pyrrole, 1*H*-pyrrolo[2,3-*c*]pyridine, 1*H*-pyrrolo[3,2-*b*]pyridine, 5*H*-pyrrolo[3,2-*d*]pyrimidine, thiophene, pyrazine, 1*H*-pyrazolo[3,4-*b*]pyridine, 1,2-oxazole, and 1*H*-
15 pyrazolo[1,5-*a*]pyrimidine, those groups optionally having one or more substituents selected from halogen, linear or branched (C₁-C₆)alkyl, linear or branched (C₁-C₆)alkoxy, cyano, cyclopropyl, oxetane, tetrahydrofuran, -CO-O-CH₃, trideuteriomethyl, 2-(morpholin-4-yl)ethyl and 2-(morpholin-4-yl)ethoxy. More preferably, R₃ represents a group 1-methyl-1*H*-pyrazol-4-yl, pyridin-4-yl, 1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl, 5-
20 cyano-1-methyl-1*H*-pyrrol-3-yl, 5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl, 1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl, 5-cyano-2-methyl-1-(trideuteriomethyl)-1*H*-pyrrol-3-yl.

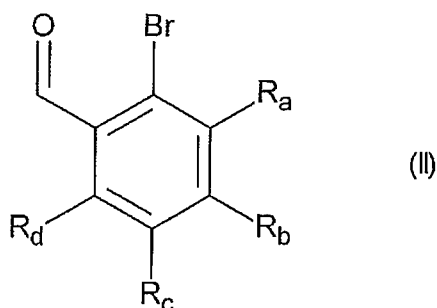
Preferred compounds according to the invention are included in the following group:

- 25 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide,

- *N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide,
- 5 - *N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide,
- 10 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide,
- 15 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1-methyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- *N*-(5-cyano-1-methyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 20 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide,
- 25 - *N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 30 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[5-cyano-2-methyl-1-(trideuteriomethyl)-1*H*-pyrrol-3-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,

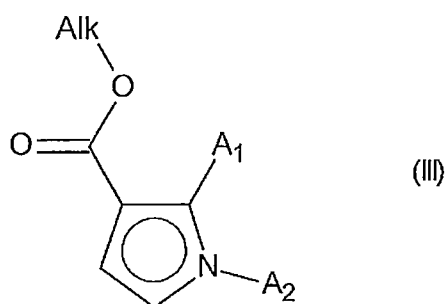
their enantiomers and diastereoisomers, and addition salts thereof with a pharmaceutically acceptable acid or base.

The invention relates also to a process for the preparation of compounds of formula (I), which process is characterised in that there is used as starting material the compound of
5 formula (II):



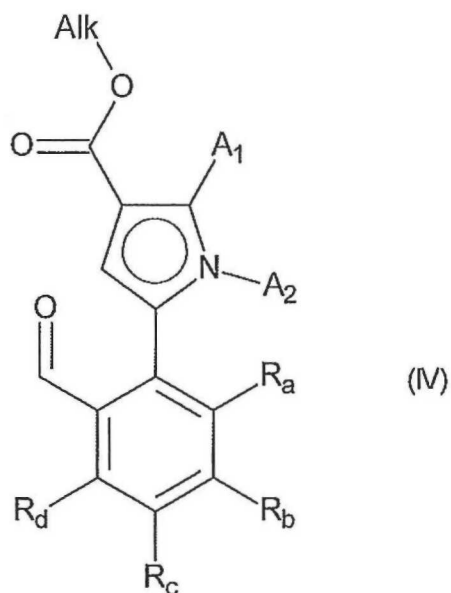
wherein R_a, R_b, R_c and R_d are as defined for formula (I),

which compound of formula (II) is subjected to a Heck reaction, in an aqueous or organic medium, in the presence of a palladium catalyst, of a base, of a phosphine and of the
10 compound of formula (III):



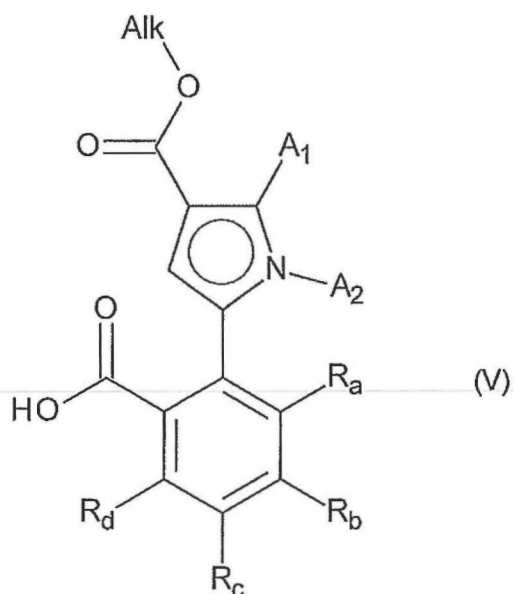
wherein the groups A₁ and A₂ are as defined for formula (I) and Alk represents a linear or branched (C₁-C₆)alkyl,

to obtain the compound of formula (IV):



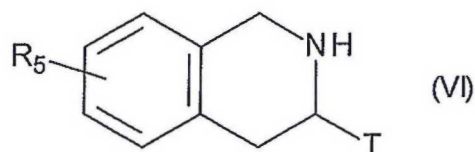
wherein A_1 , A_2 , R_a , R_b , R_c and R_d are as defined for formula (I) and Alk is as defined hereinbefore,

the aldehyde function of which compound of formula (IV) is oxidised to a carboxylic acid to form the compound of formula (V):



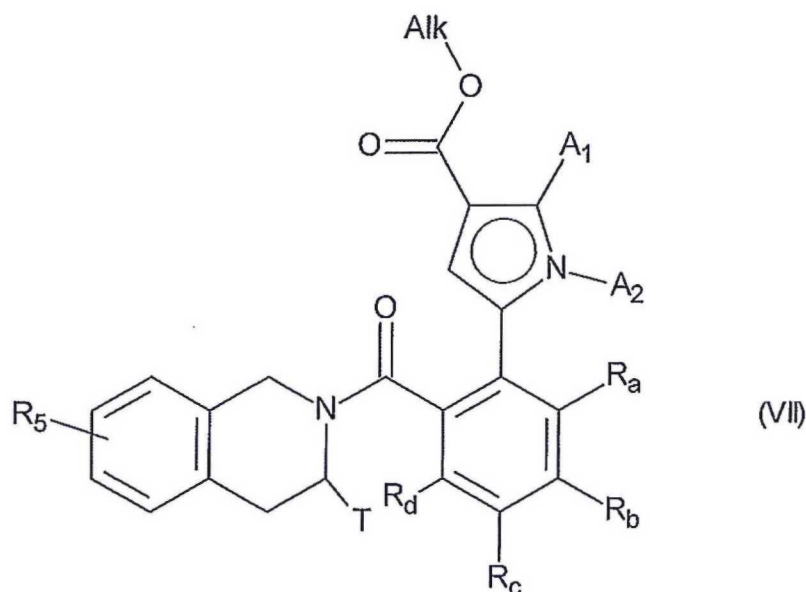
wherein A_1 , A_2 , R_a , R_b , R_c and R_d are as defined for formula (I) and Alk is as defined hereinbefore,

which compound of formula (V) is then subjected to peptide coupling with a compound of formula (VI):



wherein T and R₅ are as defined for formula (I),

5 to yield the compound of formula (VII):



wherein A₁, A₂, R_a, R_b, R_c, R_d, T and R₅ are as defined for formula (I) and Alk is as defined hereinbefore,

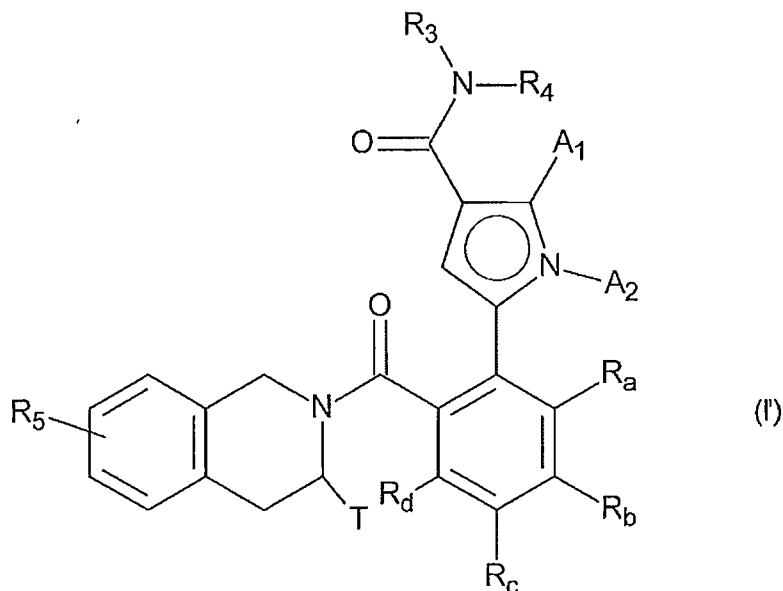
10 the ester function of which compound of formula (VII) is hydrolysed to yield the corresponding carboxylic acid or carboxylate, which may be converted into an acid derivative such as the corresponding acyl chloride or anhydride before being coupled with an amine NHR₃R₄ wherein R₃ and R₄ have the same meanings as for formula (I), to yield the compound of formula (I),

15 which compound of formula (I) may be purified according to a conventional separation technique, which is converted, if desired, into its addition salts with a pharmaceutically acceptable acid or base and which is optionally separated into its isomers according to a conventional separation technique,

it being understood that, at any time considered appropriate in the course of the above-described process, certain groups (hydroxy, amino...) of the reagents or intermediates of synthesis may be protected and then deprotected according to the requirements of synthesis.

5 More particularly, when one of the groups R_3 or R_4 of the amine NHR_3R_4 is substituted by a hydroxy function, the latter may be subjected beforehand to a protection reaction prior to any coupling with the carboxylic acid formed from the compound of formula (VII), or with a corresponding acid derivative thereof, the resulting protected compound of formula (I) subsequently undergoes a deprotection reaction and is then optionally converted into one
10 of its addition salts with a pharmaceutically acceptable acid or base.

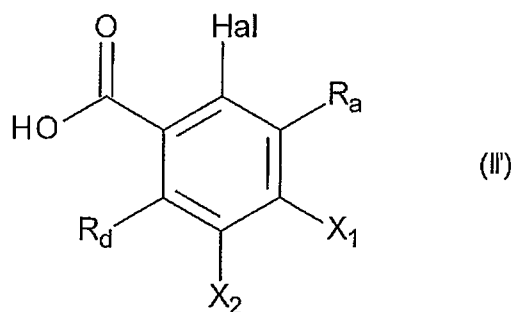
The present invention relates also to an alternative process for the preparation of compounds of formula (I'), which are particular cases of the compounds of formula (I) as defined hereinbefore:



15 wherein:

- A_1 , A_2 , R_a , R_d , R_3 , R_4 , T and R_5 are as defined for formula (I),
- R_b and R_c are such that one represents a hydrogen and the other a group selected from R_7 -CO-NH-(C₀-C₆)alkyl-, R_7 -SO₂-NH-(C₀-C₆)alkyl-, R_7 -NH-CO-NH-(C₀-C₆)alkyl- and R_7 -O-CO-NH-(C₀-C₆)alkyl-,

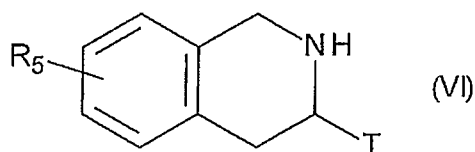
which preparation process uses as starting material a compound of formula (II'):



wherein:

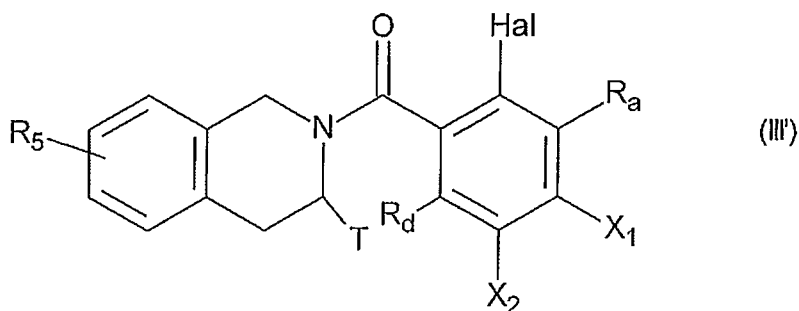
- R_a and R_d are as defined for formula (I),
- Hal represents a halogen atom,
- X₁ and X₂ are such that one represents a (C₀-C₆)alkyl-NH₂ group while the other represents a hydrogen atom,

which compound of formula (II') is then subjected to peptide coupling with a compound of formula (VI):



wherein T and R₅ are as defined for formula (I),

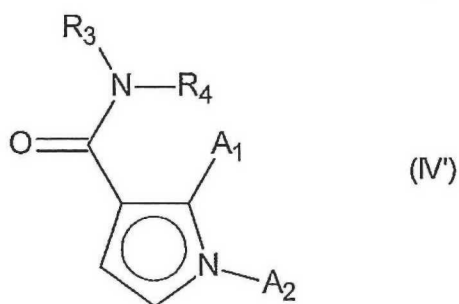
to yield the compound of formula (III'):



wherein:

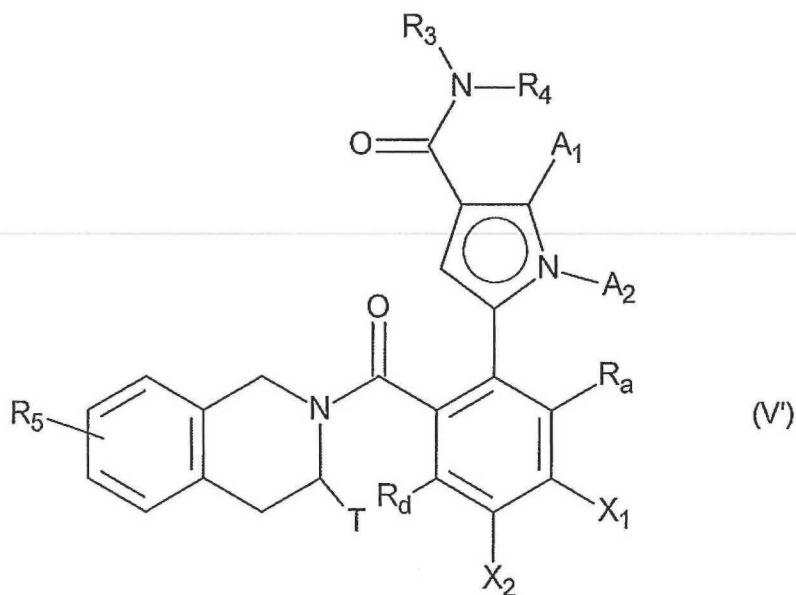
- R_a , R_d , T and R_5 are as defined for formula (I),
- Hal represents a halogen atom,
- X_1 and X_2 are such that one represents a $(C_0-C_6)alkyl-NH_2$ group while the other represents a hydrogen atom,

which compound of formula (III') is subjected to a Heck reaction, in an aqueous or organic medium, in the presence of a palladium catalyst, of a base, of a phosphine and of a compound of formula (IV'):



wherein A_1 , A_2 , R_3 and R_4 are as defined for formula (I),

to form the compound of formula (V'):



wherein:

- A_1 , A_2 , R_a , R_d , R_3 , R_4 , T and R_5 are as defined for formula (I),
- X_1 and X_2 are such that one represents a (C_0-C_6) alkyl- NH_2 group while the other represents a hydrogen atom,

5 which compound of formula (V') is then subjected to an acylation or sulphonylation reaction to yield the compound of formula (I'),

which compound of formula (I') may be purified according to a conventional separation technique, which is converted, if desired, into its addition salts with a pharmaceutically acceptable acid or base and which is optionally separated into its isomers according to a
10 conventional separation technique,

it being understood that, at any time considered appropriate in the course of the above-described process, certain groups (hydroxy, amino...) of the reagents or intermediates of synthesis may be protected and then deprotected according to the requirements of synthesis.

15 The compounds of formulae (II), (III), (II'), (IV'), (VI) and the amine NHR_3R_4 are either commercially available or can be obtained by the person skilled in the art using conventional chemical reactions described in the literature.

Pharmacological study of the compounds of the invention has shown that they have pro-apoptotic properties. The ability to reactivate the apoptotic process in cancerous cells is of
20 major therapeutic interest in the treatment of cancers, auto-immune diseases and diseases of the immune system.

More especially, the compounds according to the invention will be useful in the treatment of chemo- or radio-resistant cancers, and in malignant haemopathies and small-cell lung cancer.

25 Among the cancer treatments envisaged there may be mentioned, without implying any limitation, cancers of the bladder, brain, breast and uterus, chronic lymphoid leukaemias, colorectal cancer, cancers of the oesophagus and liver, lymphoblastic leukaemias, non-

Hodgkin lymphomas, melanomas, malignant haemopathies, myelomas, ovarian cancer, non-small-cell lung cancer, prostate cancer and small-cell lung cancer. Among non-Hodgkin lymphomas, there may be mentioned more preferably follicular lymphomas, mantle cell lymphomas, diffuse large B-cell lymphomas, small lymphocytic lymphomas and marginal zone B-cell lymphomas.

The present invention relates also to pharmaceutical compositions comprising at least one compound of formula (I) in combination with one or more pharmaceutically acceptable excipients.

Among the pharmaceutical compositions according to the invention there may be mentioned more especially those that are suitable for oral, parenteral, nasal, per- or trans-cutaneous, rectal, perlingual, ocular or respiratory administration, especially tablets or dragées, sublingual tablets, sachets, paquets, capsules, glossettes, lozenges, suppositories, creams, ointments, dermal gels, and drinkable or injectable ampoules.

The dosage varies according to the sex, age and weight of the patient, the administration route, the nature of the therapeutic indication, or of any associated treatments, and ranges from 0.01 mg to 1 g per 24 hours in one or more administrations.

Furthermore, the present invention relates also to the association of a compound of formula (I) with an anticancer agent selected from genotoxic agents, mitotic poisons, anti-metabolites, proteasome inhibitors, kinase inhibitors and antibodies, and also to pharmaceutical compositions comprising that type of association and their use in the manufacture of medicaments for use in the treatment of cancer.

The compounds of the invention may also be used in association with radiotherapy in the treatment of cancer.

Finally, the compounds of the invention may be linked to monoclonal antibodies or fragments thereof or linked to scaffold proteins that can be related or not to monoclonal antibodies.

Antibody fragments must be understood as fragments of Fv, scFv, Fab, F(ab')₂, F(ab'), scFv-Fc type or diabodies, which generally have the same specificity of binding as the antibody from which they are descended. According to the present invention, antibody fragments of the invention can be obtained starting from antibodies by methods such as digestion by enzymes, such as pepsin or papain, and/or by cleavage of the disulfide bridges by chemical reduction. In another manner, the antibody fragments comprised in the present invention can be obtained by techniques of genetic recombination likewise well known to the person skilled in the art or else by peptide synthesis by means of, for example, automatic peptide synthesizers such as those supplied by the company Applied Biosystems, etc.

Scaffold proteins that can be related or not to monoclonal antibodies are understood to mean a protein that contains or not an immunoglobulin fold and that yields a binding capacity similar to a monoclonal antibody. The man skilled in the art knows how to select the protein scaffold. More particularly, it is known that, to be selected, such a scaffold should display several features as follow (Skerra A., J. Mol. Recogn., 13, 2000, 167-187): phylogenetically good conservation, robust architecture with a well-known three-dimensional molecular organization (such as, for example, crystallography or NMR), small size, no or only a low degree of post-translational modifications, easy to produce, express and purify. Such a protein scaffold can be, but without limitation, a structure selected from the group consisting in fibronectin and preferentially the tenth fibronectin type III domain (FNfn10), lipocalin, anticalin (Skerra A., J. Biotechnol., 2001, 74(4):257-75), the protein Z derivative from the domain B of staphylococcal protein A, thioredoxin A or any protein with a repeated domain such as an "ankyrin repeat" (Kohl et al., PNAS, 2003, vol.100, No.4, 1700-1705), "armadillo repeat", "leucine-rich repeat" or "tetratricopeptide repeat". There could also be mentioned a scaffold derivative from toxins (such as, for example, scorpion, insect, plant or mollusc toxins) or protein inhibitors of neuronal nitric oxide synthase (PIN).

The following Preparations and Examples illustrate the invention without limiting it in any way.

Preparation 1: **4-Chloro-2-[4-(ethoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]benzoic acid**

Step A: Ethyl 1,2-dimethyl-1H-pyrrole-3-carboxylate

To a solution of 10 g of ethyl 2-methyl-1H-pyrrole-3-carboxylate (65.3 mmol) and 8.95 mL (130.6 mmol) of methyl iodide in 70 mL of dimethylformamide placed at 0°C there are added, in three portions, 2.61 g (65.3 mmol) of sodium hydride (NaH) 60 %. The batch is then stirred at 0°C for 1 hour. Then, the reaction mixture is hydrolysed by the addition of 420 mL of ice-cold water. The reaction mixture is then diluted with ethyl acetate, successively washed with 0.1M aqueous hydrochloric acid (HCl) solution, saturated aqueous LiCl solution and then brine. The organic phase is then dried over MgSO₄, filtered, concentrated to dryness and purified by chromatography over silica gel (petroleum ether/AcOEt gradient).

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 6.65 (d, 1H pyrrole); 6.3 (1d, 1H pyrrole); 4.1 (1q, 2H, OCH₂CH₃); 3.5 (s, 3H N-pyrrole); 2.4 (s, 3H pyrrole); 1.5 (1t, 3H OCH₂CH₃)

IR: ν: >C=O: 1688 cm⁻¹; ν: C-O-C: 1172 cm⁻¹

Step B: Ethyl 5-(5-chloro-2-formylphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxylate

To a solution of 10.5 g of the compound obtained in Step A (62,8 mmol) in 65 mL of *N,N*-dimethylacetamide there are successively added 15.2 g of 2-bromo-4-chlorobenzaldehyde (69 mmol), 12.3 g of potassium acetate (125.6 mmol) and then the batch is stirred under argon for 20 minutes. There are then added 2.2 g of palladium catalyst PdCl₂(PPh₃)₂ (3.14 mmol). The reaction mixture is then heated at 130°C overnight. The mixture is allowed to return to ambient temperature and it is then diluted with dichloromethane. Animal charcoal is added (2 g per g of product) and the batch is stirred at ambient temperature for 1 hour and then filtered. The organic phase is then washed with water, dried over MgSO₄ and concentrated to dryness. The crude product thereby obtained is purified by chromatography over silica gel (petroleum ether/AcOEt gradient). The title product is obtained in the form of a solid.

¹H NMR: δ (400 MHz; dmso-d₆; 300K): 9.8 (s, 1H, formyl); 7.91-7.69-7.61 (d, 3H, aromatic Hs); 6.5 (s, 1H pyrrole); 4.2 (q, 2H, OCH₂CH₃); 3.4 (s, 3H, CH₃-N-pyrrole); 2.55 (s, 3H pyrrole); 1.28 (t, 3H, OCH₂CH₃)

Step C: 4-Chloro-2-[4-(ethoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]benzoic acid

5 A solution is prepared containing 12.85 g of the compound obtained in Step B (42 mmol) and 35.7 mL (336 mmol) of 2-methyl-2-butene in a mixture containing 20 mL of acetone and 20 mL of tetrahydrofuran. There are added, dropwise, 200 mL of an aqueous solution containing a mixture of 13.3 g of sodium chlorite (NaClO₂) (147 mmol) and 14.5 g of sodium hydrogen phosphate (NaHPO₄) (105 mmol). The batch is then vigorously stirred at
10 ambient temperature for 7 hours. The reaction mixture is then concentrated to remove the acetone. Ethyl acetate is added, and the organic phase is washed with water, dried over MgSO₄ and then concentrated to dryness. The residue is then taken up in a minimum of ethyl ether. The solid then obtained is filtered off, washed with ether and then dried *in vacuo* at 40°C overnight. The title product is obtained in the form of a solid, which is
15 subsequently used without being otherwise purified.

¹H NMR: δ (400 MHz; dmso-d₆; 300K): 13 (m, 1H COOH); 7.85-7.6-7.41(d,dd, wd, 3H, aromatic Hs); 6.3 (s, 1H, H pyrrole); 4.15 (q, 2H, OCH₂CH₃); 3.25 (s, 3H, CH₃-N-pyrrole); 2.5 (s, 3H, CH₃-pyrrole); 1.25 (t, 3H, OCH₂CH₃)

IR: ν : -OH: 3100-2500 cm⁻¹ acid; ν : >C=O: 1681 cm⁻¹ ester + acid

20 **Preparation 2:** **2-[4-(Ethoxycarbonyl)-1-methyl-1H-pyrrol-2-yl]benzoic acid**

The procedure is in accordance with the process of Preparation 1, replacing, on the one hand, the ethyl 2-methyl-1H-pyrrole-3-carboxylate used in Step A by ethyl 1H-pyrrole-3-carboxylate and, on the other hand, the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-benzaldehyde.

25 **Preparation 3:** **4-Chloro-2-[4-(ethoxycarbonyl)-1-methyl-1H-pyrrol-2-yl]benzoic acid**

The procedure is in accordance with the process of Preparation 1, replacing the ethyl 2-methyl-1H-pyrrole-3-carboxylate used in Step A by ethyl 1H-pyrrole-3-carboxylate.

Preparation 4: 6-[4-(Ethoxycarbonyl)-1-methyl-1*H*-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Preparation 1, replacing, on the one hand, the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate used in Step A by ethyl 1*H*-pyrrole-3-carboxylate and, on the other hand, the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

IR: ν : -OH: 3500-2300 cm^{-1} acid; ν : >C=O : 1688-1670 cm^{-1} ester + acid

Preparation 5: 4-Chloro-2-[4-(ethoxycarbonyl)-1-ethyl-1*H*-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A, on the one hand, the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by ethyl 1*H*-pyrrole-3-carboxylate and, on the other hand, the methyl iodide by ethyl iodide (see the protocol described in US 6,258,805 B1).

Preparation 6: 4-Chloro-2-[1-cyclopropyl-4-(ethoxycarbonyl)-1*H*-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A, on the one hand, the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by ethyl 1*H*-pyrrole-3-carboxylate and, on the other hand, the methyl iodide by cyclopropylboronic acid (see the protocol described in Bénard S. *et al*, Journal of Organic Chemistry 73(16), 6441-6444, 2008).

Preparation 7: 4-Chloro-2-[4-(ethoxycarbonyl)-1-(propan-2-yl)-1*H*-pyrrol-2-yl]-benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A, on the one hand, the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by ethyl 1*H*-pyrrole-3-carboxylate and, on the other hand, the methyl iodide by isopropyl iodide (see the protocol described in Okada E. *et al*, Heterocycles 34(7), 1435-1441, 1992).

Preparation 8: 4-Fluoro-2-[4-(methoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing, in Step A, the ethyl 2-methyl-1H-pyrrole-3-carboxylate by methyl 2-methyl-1H-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-4-fluorobenzaldehyde.

IR: ν : -OH: 2727-2379 cm^{-1} acid; ν : >C=O : 1687 cm^{-1}

Preparation 9: 6-{1-[2-(Benzyloxy)ethyl]-4-(ethoxycarbonyl)-5-methyl-1H-pyrrol-2-yl}-1,3-benzodioxole-5-carboxylic acid

Step A: Ethyl 1-[2-(benzyloxy)ethyl]-2-methyl-1H-pyrrole-3-carboxylate

The procedure is in accordance with the process of Step A of Preparation 1, replacing the methyl iodide used as alkylating agent by benzyl 2-bromoethyl ether.

^1H NMR: δ (400 MHz; dmso-d_6 ; 300K): 7.32 (t, 2H, aromatic Hs, H *meta* benzyl ether); 7.3 (t, 1H, aromatic H, H *para* benzyl ether); 7.23 (d, 2H, aromatic Hs, H *ortho* benzyl ether); 6.72 (d, 1H, H- pyrrole); 6.35 (d, 1H, H- pyrrole); 4.48 (s, 2H, aliphatic Hs, O- CH_2 -Ph); 4.15 (q, 2H, aliphatic Hs, O- CH_2 - CH_3); 4.1 (t, 2H, aliphatic Hs, CH_2 -O- CH_2 -Ph); 3.7 (t, 2H, aliphatic Hs, CH_2 - CH_2 -O- CH_2 -Ph); 2.45 (s, 3H, CH_3 - pyrrole); 1.25 (t, 3H, aliphatic Hs, O- CH_2 - CH_3)

IR: ν : >C=O : 1689 cm^{-1}

Step B: 6-{1-[2-(Benzyloxy)ethyl]-4-(ethoxycarbonyl)-5-methyl-1H-pyrrol-2-yl}-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the processes of Steps B and C of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

^1H NMR: δ (400 MHz; dmso-d_6 ; 300K): 7.35 (s, 1H, aromatic H, H benzodioxole); 7.30 (m, 3H, aromatic Hs, H benzyl ether); 7.25 (s, 1H, aromatic H, H benzodioxole); 7.10 (d,

2H, aromatic Hs, H *ortho* benzyl ether); 12.55 (broad s, 1H, COOH); 6.75 (s, 1H, H-pyrrole); 6.15 (broad s, 2H, aliphatic Hs, O-CH₂-O); 4.30 (s, 2H, aliphatic Hs, O-CH₂-Ph); 4.15 (q, 2H, aliphatic Hs, O-CH₂-CH₃); 3.9 (m, 2H, aliphatic Hs, CH₂-CH₂-O-CH₂-Ph); 3.40 (t, 2H, aliphatic Hs, CH₂-CH₂-O-CH₂-Ph); 2.50 (s, 3H, CH₃-pyrrole); 1.25 (t, 3H, aliphatic Hs, O-CH₂-CH₃)

IR: ν : -OH: 3200-2300 cm⁻¹ acid; ν : >C=O: 1687 cm⁻¹ acid

Preparation 10: 2-{1-[3-(Benzyloxy)propyl]-4-(ethoxycarbonyl)-5-methyl-1H-pyrrol-2-yl}-4-fluorobenzoic acid

The procedure is in accordance with the process of Preparation 9, replacing the benzyl 2-bromoethyl ether used in Step A by benzyl 3-bromopropyl ether and also the 6-bromo-1,3-benzodioxole-5-carbaldehyde used in Step B by 2-bromo-4-fluorobenzaldehyde.

IR: ν : -OH: 3200-2305 cm⁻¹ acid; ν : >C=O: 1690 cm⁻¹ acid

Preparation 11: 6-[4-(Ethoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

Preparation 12: 4-Methoxy-2-[4-(methoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]-benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing the ethyl 2-methyl-1H-pyrrole-3-carboxylate used in Step A by methyl 2-methyl-1H-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-4-methoxybenzaldehyde.

IR: ν : -OH: 3000-2500 cm⁻¹ acid; ν : >C=O: 1693 + 1670 cm⁻¹ acid + ester

Preparation 13: 7-[4-(Methoxycarbonyl)-1,5-dimethyl-1*H*-pyrrol-2-yl]-2,3-dihydro-1,4-benzodioxin-6-carboxylic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by methyl 2-methyl-1*H*-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 7-bromo-2,3-dihydro-1,4-benzodioxin-6-carbaldehyde.

IR: ν : -OH: 3100-2500 cm^{-1} acid; ν : >C=O : 1690 + 1674 cm^{-1} acid + ester

Preparation 14: 4-Fluoro-5-methoxy-2-[4-(methoxycarbonyl)-1,5-dimethyl-1*H*-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by methyl 2-methyl-1*H*-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-4-fluoro-5-methoxybenzaldehyde.

Preparation 15: 4-Fluoro-5-hydroxy-2-[4-(methoxycarbonyl)-1,5-dimethyl-1*H*-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by methyl 2-methyl-1*H*-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-4-fluoro-5-hydroxy-benzaldehyde.

Preparation 16: 6-[4-(Ethoxycarbonyl)-1-methyl-5-trifluoromethyl-1*H*-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by ethyl 2-(trifluoromethyl)-1*H*-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

Preparation 17: 6-[4-(Ethoxycarbonyl)-1-ethyl-5-methyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Preparation 11, replacing the methyl iodide by ethyl iodide (see the protocol described in US 6,258,805 B1).

Preparation 18: 6-[4-(Ethoxycarbonyl)-1-methyl-5-(trifluoromethyl)-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

Step A: Ethyl 1-methyl-2-(trifluoromethyl)pyrrole-3-carboxylate

Ethyl 4,4,4-trifluoro-3-oxo-butanoate (29 ml, 0.219 mmol) is added to methylamine (40 % solution in water) (50 ml, 0.580 mmol) cooled to 10°C; a white precipitate forms. 1,2-Dibromoethyl acetate (prepared according to *Molecules*, 16, 9368-9385; 2011) is added dropwise. The reactor is then sealed and heated at 70°C for 45 minutes. The reaction mixture is cooled, then extracted with ethyl acetate, dried over sodium sulphate (Na₂SO₄) and evaporated to dryness. The crude reaction product obtained is purified by chromatography over silica gel using heptane and ethyl acetate as eluants. The expected compound is obtained in the form of crystals.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.11 (d, 1 H), 6.52 (d, 1 H), 4.21 (quad, 2 H), 3.8 (s, 3 H), 1.27 (t, 3 H)

¹⁹F NMR (400 MHz, dmso-d₆) δ ppm: -53.9

IR (ATR) cm⁻¹: 3145 + 3128 ν -CH, 1711 ν >C=O, 1183 + 1117 + 1078 ν -CF₃

Step B: 6-[4-(Ethoxycarbonyl)-1-methyl-5-(trifluoromethyl)-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the protocol described in Steps B and C of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

Preparation 19: 6-[1-(2-Benzyloxyethyl)-4-ethoxycarbonyl-5-methyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

Step A: Ethyl 1-(2-benzyloxyethyl)-2-methyl-pyrrole-3-carboxylate

Ethyl 2-methyl-1H-pyrrole-3-carboxylate (10 g, 65.3 mmol) is dissolved in 100 mL of dimethylformamide under argon cooled to 0°C, and then 2-bromoethoxymethylbenzene (28.1 g, 130.6 mmol) is added all at once. The reaction mixture is placed under stirring. There is then added thereto, at 0°C, in three portions, NaH (1.72 g, 71.83 mmol) over a period of 15 minutes. The reaction mixture is stirred for 15 minutes at 0°C, and then for 15 hours at ambient temperature. It is then poured into an ice bath and then extracted 3 times with ethyl acetate. The organic phase is washed 3 times with saturated aqueous lithium chloride solution, dried over MgSO₄, filtered and then evaporated to dryness. The residue thereby obtained is purified by chromatography over silica gel using petroleum ether and ethyl acetate as eluants. The expected compound is obtained in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.32 (t, 2 H), 7.3 (t, 1 H), 7.23 (d, 2 H), 6.72 (d, 1 H), 6.35 (d, 1 H), 4.48 (s, 2 H), 4.15 (quad., 2 H), 4.1 (t, 2 H), 3.7 (t, 2 H), 2.45 (s, 3 H), 1.25 (t, 3 H)

IR (ATR) cm⁻¹: 1689 ν -C=O

Step B: Ethyl 1-(2-benzyloxyethyl)-5-(6-formyl-1,3-benzodioxol-5-yl)-2-methyl-pyrrole-3-carboxylate

The procedure is in accordance with the process of Step B of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 9.5 (s, 1 H), 7.3 (s, 1 H), 7.25 (m, 3 H), 7.05 (m, 2 H), 7 (s, 1 H), 6.4 (s, 1 H), 6.2 (bs, 2 H), 4.25 (s, 2 H), 4.2 (quad., 2 H), 4.05 (m, 2 H), 3.4 (m, 2 H), 2.55 (s, 3 H), 1.25 (t, 3 H)

Step C: 6-[1-(2-Benzyloxyethyl)-4-ethoxycarbonyl-5-methyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Step C of Preparation 1.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 12.55 (bs, 1 H), 7.35 (s, 1 H), 7.3 (m, 3 H), 7.2 (m, 3 H), 6.75 (s, 1 H), 6.15 (s, 2 H), 4.3 (s, 2 H), 4.15 (quad., 2 H), 3.9 (m, 2 H), 3.4 (t, 2 H), 2.5 (s, 3 H), 1.25 (t, 3 H)

IR (ATR) cm⁻¹: 3200-2300 ν -OH, 1687 (+ shoulder) ν-C=O carboxylic acid + conjugated ester

Preparation 20: 6-[4-(Ethoxycarbonyl)-1-ethyl-5-methyl-1*H*-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the protocol described in Preparation 11, replacing the methyl iodide by ethyl iodide.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 12.49 (bs, 1 H), 7.33 (s, 1 H), 6.89 (s, 1 H), 6.17 (s, 2 H), 6.13 (s, 1 H), 4.15 (quad, 2 H), 3.69 (quad, 2 H), 2.51 (s, 3 H), 1.24 (t, 3 H), 1.01 (t, 3 H)

Preparation 21: 6-[4-(Ethoxycarbonyl)-1-(2-fluoroethyl)-5-methyl-1*H*-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the process of Preparation 11, replacing the methyl iodide by 1-bromo-2-fluoroethane.

¹H NMR (400 MHz, dmso-d₆, 300K) δ ppm: 12.53 (bs, 1 H), 7.34 (s, 1 H), 6.9 (s, 1 H), 6.16 (s, 1 H), 6.16 (s, 2 H), 4.4 (dt, 2 H), 4.15 (quad, 2 H), 4.01 (m, 2 H), 2.51 (s, 3 H), 1.24 (t, 3 H)

¹⁹F NMR (400 MHz, dmso-d₆, 300 K) δ ppm: -222

IR: ν: -OH: 3700-2400 cm⁻¹ acid; ν: >C=O: 1689 cm⁻¹ acid; ν: >CF: 1213 cm⁻¹

Preparation 22: 6-{4-(Ethoxycarbonyl)-1-methyl-5-[2-(morpholin-4-yl)ethyl]-1H-pyrrol-2-yl}-1,3-benzodioxole-5-carboxylic acid

Step A: 3,3-Diethoxypropanoic acid

To a solution of 25 g of ethyl 3,3-diethoxypropionate (131 mmol) in 79 mL of methanol there are added 13.1 mL of aqueous 35 % sodium hydroxide solution (452 mmol). The reaction mixture is stirred at ambient temperature for 3 hours. The reaction mixture is then concentrated to remove the methanol. After dissolving the undissolved material by adding water, aqueous 5N HCl solution is added to obtain a pH of 5. Dichloromethane is added and then the organic phase is washed with brine. After drying over MgSO_4 and concentrating to dryness, the title product is obtained in the form of an oil which is used in the next Step without being otherwise purified.

^1H NMR (400 MHz, $\text{dms}\text{-d}_6$) δ ppm: 12.2 (s, 1 H), 4.8 (t, 1 H), 3.58/3.47 (2m, 4 H), 2.5 (d, 2 H), 1.09 (t, 6 H)

Step B: Ethyl 5,5-diethoxy-3-oxo-pentanoate

To a solution of 16 mL of 3-ethoxy-3-oxomalonic acid (135 mmol) in 40 mL of tetrahydrofuran there are added, under argon, 21.9 g of powdered magnesium (90.4 mmol). The mixture obtained is then heated at 80°C for 7 hours. After returning to ambient temperature, this mixture is transferred by cannula to a solution of 10 g of the compound obtained in Step A (61.7 mmol) in 64 mL of tetrahydrofuran to which there has previously been added, in portions, 11 g of carbonyldiimidazole (66 mmol). The reaction mixture is stirred for 3 days at ambient temperature. After concentration, the residue is taken up in a mixture of ethyl acetate and aqueous sodium hydrogen sulphate (NaHSO_4) solution. The mixture is stirred vigorously until no more gas is evolved. After separation of the phases, the organic phase is washed successively with water, saturated aqueous NaHCO_3 solution and finally brine. After drying over MgSO_4 and concentrating to dryness, the title product is obtained in the form of an oil which is used in the next Step without being otherwise purified.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 4.84 (t, 1 H), 4.08 (q, 2 H), 3.59 (s, 2 H), 3.56/3.46 (2m, 4 H), 2.8 (d, 2 H), 1.18 (t, 3 H), 1.09 (t, 6 H)

Step C: Ethyl 2-(2,2-diethoxyethyl)-1-methyl-pyrrole-3-carboxylate

To a solution of 11.8 g of the compound obtained in Step B (50.8 mmol) in 76 mL of water there are added, dropwise at 0°C, 6.6 ml of aqueous 40 % methylamine solution (76.2 mmol). The reaction mixture is stirred and gently reheated to ambient temperature over 5 hours. After returning to 0°C, 8.8 mL of aqueous 40 % methylamine solution (102 mmol) and then 16.6 mL of aqueous 50 % chloroacetaldehyde solution (127 mmol) are each added dropwise at a temperature of less than 10°C. The reaction mixture is stirred at ambient temperature for 16 hours and then diluted with ethyl acetate. The organic phase is washed with brine, dried over MgSO₄ and concentrated to dryness. The crude product thereby obtained is purified by chromatography over silica gel using petroleum ether and ethyl acetate as eluants. The title product is obtained in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 6.7 (d, 1 H), 6.33 (d, 1 H), 4.55 (t, 1 H), 4.15 (q, 2 H), 3.6 (m, 2 H), 3.6 (s, 3 H), 3.3 (m, 2 H), 3.15 (d, 2 H), 1.25 (t, 3 H), 1.05 (t, 6 H)

Step D: Ethyl 1-methyl-2-(2-morpholinoethyl)pyrrole-3-carboxylate

To a solution of 3.8 g of the compound obtained in Step C (14.05 mmol) in 28 mL of tetrahydrofuran there are added 58 mL of aqueous 10 % sulphuric acid solution. The reaction mixture is stirred at ambient temperature for 2 hours and then diluted with a mixture of ethyl acetate and water. After separation, the organic phase is washed with brine, dried over MgSO₄ and concentrated to dryness. To a solution of the residue thereby obtained in 70 mL of dichloroethane there are added a solution of 13.5 mL of morpholine (14.5 mmol) in a mixture composed of 30 mL of dichloroethane and 3.6 mL of 4N aqueous HCL solution in dioxane (14.5 mmol), and then 7.4 g of sodium triacetoxyborohydride (NaBH(OAc)₃) (35.13 mmol). The reaction mixture is stirred at ambient temperature for 3 hours and then diluted with a mixture of dichloromethane and saturated aqueous NaHCO₃ solution. After separation of the phases and extraction of the aqueous phase with dichloromethane, the organic phases are dried over MgSO₄ and concentrated to dryness.

The crude product thereby obtained is purified by chromatography over silica gel using dichloromethane and methanol as eluants. The title product is isolated in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 6.66 (d, 1 H), 6.31 (d, 1 H), 4.14 (q, 2 H), 3.58 (s, 3 H), 3.57 (m, 4 H), 3.05 (m, 2 H), 2.45-2.38 (m, 6 H), 1.24 (t, 3 H)

5 **Step E: 6-{4-(Ethoxycarbonyl)-1-methyl-5-[2-(morpholin-4-yl)ethyl]-1H-pyrrol-2-yl}-1,3-benzodioxole-5-carboxylic acid**

The procedure is in accordance with Steps B and C of Preparation, 1 replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

10 **Preparation 23: 6-[4-(Ethoxycarbonyl)-1-methyl-5-(morpholin-4-ylmethyl)-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid**

Step A: Ethyl 4,4-diethoxy-3-oxo-butanoate

To a solution of 40 g of ethyl diethoxyacetate (227 mmol) in 67 mL of ethyl acetate there are added under argon, in portions, 6 g of sodium (261 mmol). The reaction mixture is then stirred at ambient temperature for 48 hours. There are added 10 mL of methanol, and then the mixture is hydrolysed with 65 mL of water. The pH of the reaction mixture is adjusted to pH 6 by adding 1N aqueous HCl solution. The mixture is separated and then extracted with ethyl acetate. The organic phases are combined, washed with brine, dried over MgSO₄, filtered and concentrated to dryness. The title product is obtained in the form of an oil which is used in the next Step without being otherwise purified.

¹H NMR (400 MHz, CDCl₃) δ ppm: 3.6 (s, 2 H), 1.28 (t, 9 H), 3.7-3.6 (2m, 4 H), 4.7 (s, 1 H), 4.2 (quad, 2 H)

Step B: Ethyl 2-(2,2-diethoxymethyl)-1-methyl-pyrrole-3-carboxylate

The title compound is obtained in accordance with the process described in Step C of Preparation 22, starting from the ethyl 4,4-diethoxy-3-oxo-butanoate obtained in the preceding Step.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 6.73 (d, 1 H), 6.32 (d, 1 H), 6.23 (s, 1 H), 4.17 (q, 2 H), 3.7 (s, 3 H), 3.68/3.43 (2m, 4 H), 1.26 (t, 3 H), 1.13 (t, 6 H)

Step C: Ethyl 1-methyl-2-(2-morpholinomethyl)pyrrole-3-carboxylate

The title compound is obtained in accordance with the process described in Step D of Preparation 22, starting from the ethyl 2-(2,2-diethoxymethyl)-1-methyl-pyrrole-3-carboxylate obtained in the preceding Step.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 6.74 (d, 1 H), 6.32 (d, 1 H), 4.15 (q, 2 H), 3.8 (s, 2 H), 3.65 (s, 3 H), 3.5 (m, 4 H), 2.32 (m, 4 H), 1.22 (t, 3 H)

Step D: 6-[4-(Ethoxycarbonyl)-1-methyl-5-(morpholin-4-ylmethyl)-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the protocol described in Steps B and C of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

Preparation 24: 6-[4-(Methoxycarbonyl)-5-(2-methoxyethyl)-1-methyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

Step A: Methyl 2-(2-methoxyethyl)-1-methyl-pyrrole-3-carboxylate

The title compound is obtained in accordance with the protocol of Step C of Preparation 22, using methyl 5-methoxy-3-oxovalerate.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 6.69 (wd, 1 H), 6.31 (wd, 1 H), 3.69 (s, 3 H), 3.59 (s, 3 H), 3.49 (t, 2 H), 3.2 (s, 3 H), 3.11 (t, 2 H)

Step B: 6-[4-(Methoxycarbonyl)-5-(2-methoxyethyl)-1-methyl-1H-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the protocol described in Steps B and C of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 6-bromo-1,3-benzodioxole-5-carbaldehyde.

Preparation 25: 2-[4-(Ethoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromobenzaldehyde.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 12.81 (m, 1 H), 7.84 (m, 1 H), 7.59 (m, 1 H), 7.51 (m, 1 H), 7.35 (m, 1 H), 6.23 (s, 1 H), 4.16 (q, 2 H), 3.24 (s, 3 H), 2.5 (s, 3 H), 1.25 (t, 3 H)

Preparation 26: 5-Fluoro-2-[4-(methoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]benzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1H-pyrrole-3-carboxylate by methyl 2-methyl-1H-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-5-fluorobenzaldehyde.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.6 (dd, 1 H), 7.42 (m, 2 H), 6.22 (s, 1 H), 4.15 (q, 2 H), 3.21 (s, 3 H), 2.5 (s, 3 H), 1.23 (t, 3 H)

¹⁹F NMR (400 MHz, dmso-d₆) δ ppm: -113

Preparation 27: 2-[4-(Ethoxycarbonyl)-1,5-dimethyl-1H-pyrrol-2-yl]-5-fluoro-4-methoxybenzoic acid

The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1H-pyrrole-3-carboxylate by methyl 2-methyl-1H-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-4-methoxy-5-fluorobenzaldehyde.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 9.65 (d, 1 H), 7.67 (d, 1 H), 7.24 (d, 1 H), 6.48 (s, 1 H), 4.19 (q, 2 H), 3.97 (s, 3 H), 3.38 (s, 3 H), 2.56 (s, 3 H), 1.26 (t, 3 H).

Preparation 28: 2-(4-Ethoxycarbonyl-1,5-dimethyl-1*H*-pyrrol-2-yl)-4-fluoro-5-methoxybenzoic acid

5 The procedure is in accordance with Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 4-fluoro-5-methoxybenzaldehyde.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 12.9 (m, 1 H), 7.6 (d, 1 H), 7.22 (d, 1 H), 6.23 (s, 1 H), 4.2 (quad, 2 H), 3.95 (s, 3 H), 3.25 (s, 3 H), 2.5 (s, 3 H), 1.25 (t, 3 H)

Preparation 29: 5-Chloro-2-[4-(ethoxycarbonyl)-1,5-dimethyl-1*H*-pyrrol-2-yl]benzoic acid

10 The procedure is in accordance with the process of Preparation 1, replacing the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-5-chlorobenzaldehyde.

Preparation 30: 2-{1-[2-(Benzyloxy)ethyl]-4-(ethoxycarbonyl)-5-methyl-1*H*-pyrrol-2-yl}-4-chlorobenzoic acid

15 The procedure is in accordance with the process of Preparation 19, replacing the 6-bromo-1,3-benzodioxole-5-carbaldehyde by 2-bromo-4-chlorobenzaldehyde.

Preparation 31: 5-Methoxy-2-[4-(methoxycarbonyl)-1,5-dimethyl-1*H*-pyrrol-2-yl]-benzoic acid

20 The procedure is in accordance with the process of Preparation 1, replacing in Step A the ethyl 2-methyl-1*H*-pyrrole-3-carboxylate by methyl 2-methyl-1*H*-pyrrole-3-carboxylate and also the 2-bromo-4-chlorobenzaldehyde used in Step B by 2-bromo-5-methoxybenzaldehyde.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 12.8 (bs, 1 H), 7.34 (wd, 1 H), 7.26 (d, 1 H), 7.15 (dd, 1 H), 6.19 (s, 1 H), 3.84 (s, 3 H), 3.69 (s, 3 H), 3.22 (s, 3 H), 2.5 (s, 3 H)

Preparation 32: 6-[1-(2,2-Difluoroethyl)-4-(ethoxycarbonyl)-5-methyl-1*H*-pyrrol-2-yl]-1,3-benzodioxole-5-carboxylic acid

The procedure is in accordance with the protocol of Preparation 19, replacing the 2-bromoethoxymethylbenzene used in Step A by 2-bromo-1,1-difluoro-ethane.

5 **Preparation 1': (3*R*)-3-Methyl-1,2,3,4-tetrahydroisoquinoline hydrochloride**

Step A: {(3*S*)-2-[4-Methylphenylsulphonyl]-1,2,3,4-tetrahydroisoquinolin-3-yl}methyl 4-methylbenzenesulphonate

To a solution of 30.2 g of [(3*S*)-1,2,3,4-tetrahydroisoquinolin-3-yl]methanol (185 mmol) in 750 mL of dichloromethane there are successively added 91.71 g of tosyl chloride (481 mmol) and then, dropwise, 122.3 mL of *N,N,N*-triethylamine (740 mmol). The
10 reaction mixture is then stirred at ambient temperature for 20 hours. It is then diluted with dichloromethane, washed successively with 1M HCl solution, saturated aqueous NaHCO₃ solution and then brine until neutral. The organic phase is then dried over MgSO₄, filtered and concentrated to dryness. The solid obtained is then dissolved in a minimum volume of
15 dichloromethane and then cyclohexane is added until a precipitate is formed. This precipitate is then filtered off and washed with cyclohexane. After drying, the title product is obtained in the form of crystals.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.75 (d, 2H, aromatic Hs, *ortho* O-tosyl); 7.6 (d, 2H, aromatic Hs, *ortho* N-tosyl); 7.5 (d, 2H, aromatic Hs, *meta* O-tosyl); 7.3 (d, 2H, aromatic Hs, *meta* N-tosyl); 7.15-6.9 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.4-4.15 (dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 4.25 (m, 1H, aliphatic H, tetrahydroisoquinoline); 4.0-3.8 (2dd, 2H, aliphatic Hs, CH₂-O-tosyl); 2.7 (2dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 2.45 (s, 3H, O-SO₂-Ph- CH₃); 2.35 (s, 3H, N-SO₂-Ph- CH₃)
20

25 IR: ν: -SO₂: 1339-1165 cm⁻¹

Step B: (3*R*)-3-Methyl-2-[4-methylphenylsulphonyl]-1,2,3,4-tetrahydroisoquinoline

To a suspension of 8.15 g (214.8 mmol) of lithium aluminium hydride (LiAlH₄) in 800 mL of methyl *tert*-butyl ether (MTBE) there are added 101.2 g of the ditosyl compound

obtained in Step A (214.8 mmol) dissolved in 200 mL of MTBE. The batch is then heated at 50°C for 2 hours. It is allowed to cool and placed at 0°C, and there are then added, dropwise, 12 mL of 5N NaOH solution. The batch is stirred at ambient temperature for 45 minutes. The solid thereby obtained is then filtered off and washed with MTBE and then with dichloromethane. The filtrate is then concentrated to dryness. The title product is then obtained in the form of a solid.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.70 (d, 2H, aromatic Hs, *ortho* *N*-tosyl); 7.38 (d, 2H, aromatic Hs, *meta* *N*-tosyl); 7.2-7.0 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.4 (m, 2H, aliphatic Hs, tetrahydroisoquinoline); 4.3 (m, 1H, aliphatic H, tetrahydroisoquinoline); 2.85-2.51 (2dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 2.35 (s, 3H, *N*-SO₂-Ph-CH₃); 0.90 (d, 3H, tetrahydroisoquinoline-CH₃)

IR : ν : -SO₂: 1332-1154 cm⁻¹

Step C: (3R)-3-Methyl-1,2,3,4-tetrahydroisoquinoline

To a solution of 31.15 g (103.15 mmol) of the monotosyl compound obtained in Step B in 500 mL of anhydrous methanol there are added, in portions, 3.92 g (161 mmol) of magnesium turnings. The batch is stirred in the presence of ultrasound for 96 hours. The reaction mixture is then filtered and the solid is washed several times with methanol. The filtrate is then concentrated to dryness. After purification by chromatography over silica gel using dichloromethane and ammonia-in-ethanol as eluants, the title product is obtained in the form of an oil.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.05 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 3.90 (m, 2H, aliphatic Hs, tetrahydroisoquinoline); 2.85 (m, 1H, aliphatic H, tetrahydroisoquinoline); 2.68-2.4 (2dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 1.12 (d, 3H, tetrahydroisoquinoline-CH₃); 2.9-2.3 (m, broad, 1H, HN (tetrahydroisoquinoline))

IR: ν : -NH: 3248 cm⁻¹

Step D: (3*R*)-3-Methyl-1,2,3,4-tetrahydroisoquinoline hydrochloride

To a solution of 14.3 g (97.20 mmol) of the compound obtained in Step C in 20 mL of anhydrous ethanol there are added, dropwise, 100 mL of a 1M solution of HCl in ether. The batch is stirred at ambient temperature for 1 hour and then filtered. The crystals thereby obtained are washed with ethyl ether. After drying, the title product is obtained in the form of crystals.

¹H NMR: δ (400 MHz; dms₂-d₆; 300K): 9.57 (m, broad, 2H, NH₂⁺ (tetrahydroisoquinoline); 7.22 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.27 (s, 2H, aliphatic Hs, tetrahydroisoquinoline); 3.52 (m, 1H, aliphatic H, tetrahydroisoquinoline); 3.03--2.85 (2dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 1.39 (d, 3H, tetrahydroisoquinoline-CH₃)

IR: ν: -NH₂⁺: 3000-2300 cm⁻¹; ν: aromatic -CH: 766 cm⁻¹

Preparation 2': *tert*-Butyl [(3*S*)-1,2,3,4-tetrahydroisoquinolin-3-ylmethyl]-carbamate

Step A: Benzyl (3*S*)-3-(hydroxymethyl)-3,4-dihydro-1*H*-isoquinoline-2-carboxylate

This compound is obtained using a protocol from the literature (R. B. Kawthekar *et al* *South Africa Journal of Chemistry* 63, 195, 2009) starting from 15 g of (3*S*)-1,2,3,4-tetrahydroisoquinolin-3-ylmethanol (91,9 mmol) in the presence of benzyl chloroformate and triethylamine in solution in dichloromethane. After purification by chromatography over silica gel using petroleum ether and ethyl acetate as eluants, the title product is obtained in the form of an oil.

¹H NMR: δ (300 MHz; DMSO-d₆; 300K): 7.33 (m, 5H, aromatic Hs, O-benzyl); 7.15 (s, 4H, aromatic Hs, H tetrahydroisoquinoline); 5.13 (s, 2H, CH₂-Ph); 4.73 (d, 1H, H tetrahydroisoquinoline); 4.47 (m, H, CH₂OH); 4.36 (m, 1H, H tetrahydroisoquinoline); 4.28 (d, 1H, H tetrahydroisoquinoline); 3.39 (dd, 1H, CH₂OH); 3.23 (dd, 1H, , CH₂OH); 2.93 (dd, 1H, H tetrahydroisoquinoline); 2.86 (dd, 1H, H tetrahydroisoquinoline)

IR: ν: OH: 3416 cm⁻¹; ν: <C=O 1694 cm⁻¹; ν:aromatic >C-H: 754 cm⁻¹

Step B: Benzyl (3S)-3-(azidomethyl)-3,4-dihydroisoquinoline-2(1H)-carboxylate

This compound is obtained using a protocol from the literature (D. Pagé *et al J. Med. Chem*, 44, 2387, 2001) starting from 23 g of the compound obtained in Step A (77.3 mmol) in the presence of diphenylphosphoryl azide and triphenylphosphine in solution in THF.
5 After purification by chromatography over silica gel using petroleum ether and ethyl acetate as eluants, the title product is obtained in the form of an oil.

¹H NMR: δ (400 MHz; DMSO-d₆; 300K): 7.36 (m, 5H, aromatic Hs, O-benzyl); 7.19 (m, 4H, aromatic Hs, H tetrahydroisoquinoline); 5.16 (s, 2H, CH₂-Ph); 4.76 (d, 1H, H tetrahydroisoquinoline); 4.53 (m, 1H, H tetrahydroisoquinoline); 4.30 (m, 1H, H
10 tetrahydroisoquinoline); 3.28 (m, 2H, , CH₂N₃); 3.06 (dd, 1H, H tetrahydroisoquinoline); 2.78 (dd, 1H, H tetrahydroisoquinoline)

IR: ν : N₃: 2095 cm⁻¹; ν : <C=O: 1694 cm⁻¹; ν : aromatic >C-H: 754 cm⁻¹

Step C: Benzyl (3S)-3-(aminomethyl)-3,4-dihydroisoquinoline-2(1H)-carboxylate

To a solution of 20.9 g (64.5 mmol) of the azido compound obtained in Step B in 650 mL
15 of THF, there are successively added 25.5 g (97.2 mmol) of triphenylphosphine and 157 mL of water. The batch is refluxed for 2 hours 30 minutes. The reaction mixture is then concentrated to dryness and the residue oil is then taken up in isopropyl ether. A white precipitate appears; it is filtered off and washed with isopropyl ether. The filtrate is then concentrated to dryness and then purified by chromatography over silica gel using
20 dichloromethane and methanol as eluants. The title product is obtained in the form of an oil.

¹H NMR: δ (400 MHz; DMSO-d₆; 300K): 7.40 (m, 5H, aromatic Hs, O-benzyl); 7.20 (m, 4H, aromatic Hs, H tetrahydroisoquinoline); 5.15 (s, 2H, CH₂-Ph); 4.75-4.3 (m, 2H, H tetrahydroisoquinoline); 4.30 (d, 1H, H tetrahydroisoquinoline); 2.90 (m, 2H, , CH₂NH₂);
25 2.45 (m, 2H, H tetrahydroisoquinoline); 1.40 (m, 2H, NH₂)

IR: ν : NH₂: 3400-3300 cm⁻¹; ν : <C=O: 1688 cm⁻¹

Step D: *Benzyl (3S)-3-(((tert-butoxycarbonyl)amino)methyl)-3,4-dihydroisoquinoline-2(1H)-carboxylate*

To a solution of 18.4 g (62.1 mmol) of the compound obtained in Step C in 630 mL of dichloromethane there are successively added 17.5 mL (124 mmol) of triethylamine and, in portions, 14.9 g (68.3 mmol) of di-*tert*-butyl dicarbonate. The batch is stirred at ambient temperature for 2 h. The reaction mixture is then concentrated and ethyl acetate is then added. The organic phase is successively washed with 1M HCl solution, brine, saturated aqueous NaHCO₃ solution and then brine. After drying, concentrating to dryness and purifying by chromatography over silica gel using petroleum ether and ethyl acetate as eluants, the title product is obtained in the form of an oil.

¹H NMR: δ (400 MHz; DMSO-d₆; 300K): 7.35 (m, 5H, aromatic Hs, O-benzyl); 7.15 (m, 4H, aromatic Hs, H tetrahydroisoquinoline); 6.51 (m, 1H, NHBoc); 5.12 (s, 2H, CH₂-Ph); 4.76 (d, 1H, H tetrahydroisoquinoline); 4.51 (m, 1H, H tetrahydroisoquinoline); 4.36 (d, 1H, H tetrahydroisoquinoline); 2.95 (m, 3H, H tetrahydroisoquinoline + CH₂NHBoc); 2.71 (d, 1H, H tetrahydroisoquinoline); 1.34 (s, 9H, NHBoc)

IR: ν : NH: 3351 cm⁻¹; ν : <C=O: 1686 cm⁻¹

Step E: *tert-Butyl [(3S)-1,2,3,4-tetrahydroisoquinolin-3-ylmethyl]carbamate*

To a solution of 21 g (53 mmol) of the compound obtained in Step D in 600 mL of ethyl acetate there are added 2.1 g of palladium-on-carbon 10 %. The batch is stirred at ambient temperature under a pressure of 1.3 bars of dihydrogen for 5 hours. The reaction mixture is then filtered and then concentrated to dryness. The title product is obtained in the form of a solid.

¹H NMR: δ (400 MHz; DMSO-d₆; 300K): 7.15 (m, 4H, aromatic Hs, H tetrahydroisoquinoline); 6.85 (t, 1H, NHBoc); 3.90 (m, 2H, H tetrahydroisoquinoline); 3.00 (m, 2H, CH₂NHBoc); 2.80 (m, 1H, H tetrahydroisoquinoline); 2.65 (dd, 1H, H tetrahydroisoquinoline); 2.40 (dd, 1H, H tetrahydroisoquinoline); 1.40 (s, 9H, NHBoc)

IR: ν : NH: 3386-3205 cm⁻¹ (NH amide); ν : <C=O: 1688 cm⁻¹; ν : NH: 1526 cm⁻¹ (NH amine)

Preparation 3': (3S)-3-(4-Morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline

Step A: Benzyl (3S)-3-(4-morpholinylcarbonyl)-3,4-dihydro-2(1H)-isoquinoline-carboxylate

To a solution of 5 g of (3S)-2-[(benzyloxy)carbonyl]-1,2,3,4-tetrahydro-3-
5 isoquinolinecarboxylic acid (16 mmol) in 160 mL of dichloromethane there are added
1.5 mL of morpholine (17.6 mmol), then 9 mL of *N,N,N*-triethylamine (64 mmol), 3.3 g of
1-ethyl-3-(3'-dimethylaminopropyl)-carbodiimide (EDC) (19.2 mmol) and 2.6 g of
hydroxybenzotriazole (HOBt) (19.2 mmol). The reaction mixture is stirred at ambient
temperature overnight; it is then poured into ammonium chloride solution and extracted
10 with ethyl acetate. The organic phase is then dried over MgSO_4 , and then filtered and
evaporated to dryness. The crude product thereby obtained is then purified by
chromatography over silica gel using dichloromethane and methanol as eluants. The
product is obtained in the form of a foam.

^1H NMR: δ (400 MHz; dmsO-d_6 ; 353K): 7.30 (m, 5H benzyl); 7.15 (m, 4H, aromatic Hs);
15 5.2-5.0 (m, 3H, 2H benzyl, 1H dihydroisoquinoline); 4.75-4.5 (2d, 2H
dihydroisoquinoline); 3.55-3.3 (m, 8H morpholine); 3.15-2.9 (2dd, 2H
dihydroisoquinoline)

IR: ν : $>\text{C}=\text{O}$: 1694; 1650 cm^{-1}

Step B: Benzyl (3S)-3-(4-morpholinylmethyl)-3,4-dihydro-2(1H)-isoquinolinecarboxylate

To a solution of 5.3 g of the product obtained in Step A (13.9 mmol) in 278 mL of
20 tetrahydrofuran there are added 14 mL of borane-dimethylsulphide complex ($\text{BH}_3\text{Me}_2\text{S}$)
(27.8 mmol) at ambient temperature. The batch is heated for 4 hours at 80°C. It is allowed
to return to ambient temperature and there are then added 7 mL (14 mmol) of $\text{BH}_3\text{Me}_2\text{S}$.
The reaction mixture is again heated at 80°C for 2 hours. The tetrahydrofuran is then
25 evaporated off and then there is slowly added methanol and then 5.6 mL of 5N aqueous
HCl solution (27.8 mmol). The mixture is stirred at ambient temperature overnight, and
then at 80°C for 1 hour. Saturated aqueous NaHCO_3 solution is then added to the reaction
mixture placed at 0°C until a pH of 8 is obtained, and extraction with ethyl acetate is then

carried out. The organic phase is then dried over MgSO_4 , and then filtered and evaporated to dryness. The title product is obtained in the form of an oil.

^1H NMR: δ (400 MHz; dmsO-d_6 ; 353K): 7.43-7.30 (unresolved peak, 5H benzyl); 7.19 (m, 4H, aromatic Hs); 5.16 (m, 2H, 2H benzyl); 4.79-4.29 (d, 2H dihydroisoquinoline);
5 4.58 (m, 1H dihydroisoquinoline); 3.50 (m, 4H morpholine); 3.02-2.80 (dd, 2H dihydroisoquinoline); 2.42-2.28 (unresolved peak, 5H, 4H morpholine, 1H morpholine); 2.15 (dd, 1H morpholine)

IR: ν : $>\text{CH}$: 2810 cm^{-1} ; ν : $>\text{C}=\text{O}$: 1694 cm^{-1} ; ν : $>\text{C}-\text{O}-\text{C}<$: 1114 cm^{-1} ; ν : $>\text{CH}-\text{Ar}$: 751 ; 697 cm^{-1}

10 **Step C:** *(3S)-3-(4-Morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline*

To a solution of 4.9 g of the compound of Step B (13,4 mmol) in 67 mL of ethanol there is added 0.980 g of palladium dihydroxide (20 % by weight) at ambient temperature. The reaction mixture is placed under 1.2 bars of hydrogen at ambient temperature for 4 hours. It is then passed through a Whatman filter and the palladium is then rinsed several times
15 with ethanol. The filtrate is evaporated to dryness. The title product is obtained in the form of an oil.

^1H NMR: δ (400 MHz; dmsO-d_6 ; 300K): 7.12-7.0 (unresolved peak, 4H, aromatic Hs); 3.92 (s, 2H tetrahydroisoquinoline); 3.60 (t, 4H morpholine); 2.98 (m, 1H tetrahydroisoquinoline); 2.68 (dd, 1H tetrahydroisoquinoline); 2.5-2.3 (unresolved peak,
20 8H, 1H tetrahydroisoquinoline, 6H morpholine, 1H NH)

IR: ν : $>\text{NH}$: 3322 cm^{-1} ; ν : $>\text{C}-\text{O}-\text{C}<$: 1115 cm^{-1} ; ν : $>\text{CH}-\text{Ar}$: 742 cm^{-1}

Preparation 4': *(3S)-3-[(4-Methyl-1-piperazinyl)methyl]-1,2,3,4-tetrahydroisoquinoline*

The procedure is in accordance with the process of Preparation 3', replacing the
25 morpholine used in Step A by 1-methyl-piperazine.

Preparation 5': **(3*S*)-3-[2-(Morpholin-4-yl)ethyl]-1,2,3,4-tetrahydroisoquinoline hydrochloride**

Step A: *tert-Butyl (3*S*)-3-(2-morpholino-2-oxo-ethyl)-3,4-dihydro-1*H*-isoquinoline-2-carboxylate*

5 To a solution of 3 g (10.30 mmol) of [(3*S*)-2-(*tert*-butoxycarbonyl)-1,2,3,4-tetrahydroisoquinolin-3-yl]acetic acid in 100 mL of dichloromethane, there are added dropwise 1.10 mL (11.32 mmol) of morpholine, still dropwise 4.3 mL (30.9 mmol) of triethylamine, 2.20 g (12.40 mmol) of EDC and 1.70 g (1.68 mmol) of HOBt (hydroxybenzotriazole). The batch is stirred at ambient temperature for 15 hours. The
10 reaction mixture is then diluted with dichloromethane, successively washed with 1M HCl solution, saturated aqueous NaHCO₃ solution and then brine until neutral. The organic phase is then dried over MgSO₄, filtered and concentrated to dryness. After purification by chromatography over silica gel using dichloromethane and methanol as eluants, the title product is obtained in the form of an oil.

15 **¹H NMR:** δ (400 MHz; dmso-d₆; 300K): 7.20-7.10 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.70 (m, 1H, aliphatic Hs, CH tetrahydroisoquinoline); 4.75-4.20 (2m, 2H, aliphatic Hs, CH₂ alpha to N tetrahydroisoquinoline); 3.60 (m, 8H, aliphatic Hs, morpholine); 3.00 and 2.70 (2dd, 2H, aliphatic H, tetrahydroisoquinoline); 2.50-2.20 (2d, 2H, aliphatic Hs, CH₂CO); 1.40 (s, 9H, ¹Bu)

20 **IR:** ν: C=O: 1687; 1625 cm⁻¹

Step B: ***1-(Morpholin-4-yl)-2-[(3*S*)-1,2,3,4-tetrahydroisoquinolin-3-yl]ethanone hydrochloride***

To a solution of 2.88 g (7.18 mmol) of the compound obtained in Step A in 16 mL of dichloromethane, there are added dropwise 80 mL (80 mmol) of 1M solution of HCl in
25 ether. The batch is stirred at ambient temperature for 15 hours, and then the suspension is filtered and the precipitate washed with ether. After drying, the title product is obtained in the form of a solid.

¹H NMR: δ (400 MHz; dmso-d₆; 300K): 9.80-9.50 (m, 2H, NH₂⁺); 7.30-7.10 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.30 (m, 2H, aliphatic Hs, CH₂ alpha to N tetrahydroisoquinoline); 3.80 (m, 1H, aliphatic Hs, CH tetrahydroisoquinoline); 3.70-3.40 (2m, 8H, aliphatic Hs, morpholine); 3.15 and 2.8 (m, 4H, aliphatic H, CH₂ tetrahydroisoquinoline and CH₂CO)

IR: ν : -NH₂⁺: 2800-1900 cm⁻¹; ν : C=O: 1620 cm⁻¹

Step C: (3S)-3-[2-(Morpholin-4-yl)ethyl]-1,2,3,4-tetrahydroisoquinoline hydrochloride

A solution of 2.2 g (7.44 mmol) of the compound obtained in Step B in 22 mL of MTBE and 5 mL of dichloromethane is prepared. After cooling in an ice bath at 0°C, there are added thereto, dropwise, 15 mL (15 mmol) of 1M LiAlH₄ solution in tetrahydrofuran. The batch is then stirred at ambient temperature for 6 hours. It is placed at 0°C, and there is then added, dropwise, 1 mL of 5N NaOH solution. The batch is stirred at ambient temperature for 45 minutes. The solid is then filtered off and washed with MTBE and then with dichloromethane and the filtrate is concentrated to dryness. The oil thereby obtained is diluted with dichloromethane and there are added, dropwise, 6.3 mL of a 1M solution of HCl in ether. The batch is stirred at ambient temperature for 1 hour and then filtered. The crystals thereby obtained are washed with ethyl ether. After drying, the title product is obtained in the form of a solid.

¹H NMR: δ (400 MHz; dmso-d₆; 300K): 11.35 + 9.80 (2m, 2H, NH₂⁺); 10.00 (m, H, NH⁺); 7.20 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 4.30 (s, 2H, aliphatic Hs, CH₂ alpha to N tetrahydroisoquinoline); 4.00 + 3.85 (2m, 4H, aliphatic Hs, CH₂ alpha to N morpholine); 3.70 (m, 1H, aliphatic Hs, CH tetrahydroisoquinoline); 3.55-3.30 (m, 4H, aliphatic Hs, CH alpha to O morpholine and CH₂-morpholine); 3.15 (dd, 1H, aliphatic H, CH₂ tetrahydroisoquinoline); 3.10 (m, 2H, aliphatic H, CH alpha to O morpholine); 2.90 (dd, 1H, aliphatic H, CH₂ tetrahydroisoquinoline); 2.30 + 2.15 (2m, 2H, aliphatic H, CH₂-tetrahydroisoquinoline)

IR: ν : NH⁺ / -NH₂⁺: between 3500 and 2250 cm⁻¹; ν : C=C: weak 1593 cm⁻¹; ν : aromatic C-H: 765 cm⁻¹

Preparation 6': (3R)-3-[3-(Morpholin-4-yl)propyl]-1,2,3,4-tetrahydroisoquinoline

Step A: {(3S)-2-[(4-Methylphenyl)sulphonyl]-1,2,3,4-tetrahydroisoquinolin-3-yl}methyl 4-methylbenzenesulphonate

The process is the same as that of Step A of Preparation 1'.

5 **Step B: tert-Butyl 2-({(3R)-2-[(4-methylphenyl)sulphonyl]-1,2,3,4-tetrahydroisoquinolin-3-yl}methyl)-3-(morpholin-4-yl)-3-oxopropanoate**

To a suspension of 1 g of NaH (60 %) (25.08 mmol) in 30 mL of MTBE there are added, dropwise, a solution of 5 g of *tert*-butyl 3-morpholino-3-oxopropanoate (21.81 mmol) in 20 mL of anhydrous MTBE. This suspension stirred at ambient temperature for 1 hour and
10 then the compound obtained in Step A is added in the form of a powder. The batch is stirred at 60°C for 30 hours. 100 mL of saturated aqueous ammonium chloride solution are added. The resulting solution is extracted with dichloromethane. The organic phase is then dried over MgSO₄, filtered and concentrated to dryness. After purification by chromatography over silica gel using dichloromethane and MeOH as eluants, the expected
15 product is obtained in the form of an oil.

¹H NMR (500 MHz, dmso-d₆) δ ppm: 7.63/7.59 (2d, 2 H), 7.3/7.26 (2d, 2 H), 7.13 (m, 2 H), 7.09/6.97 (2t, 2 H), 4.64/4.55/4.36/4.28 (2AB, 2 H), 4.25/4.11 (2m, 1 H), 3.81 (m, 1 H), 3.73-3.48 (m, 4 H), 3.57-3.32 (m, 4 H), 2.51 (m, 2 H), 2.32/2.31 (2s, 3 H), 1.88/1.79 (2m, 2 H), 1.39/1.38 (2s, 9 H)

20 **IR (ATR) cm⁻¹**: ν: >C=O: 1731 (ester); ν: >C=O: 1644 (amide); ν: -SO₂: 1334-1156; ν: >C-O-C<: 1115; γ: >CH-Ar: 815-746-709

Step C: 2-({(3R)-2-[(4-Methylphenyl)sulphonyl]-1,2,3,4-tetrahydroisoquinolin-3-yl}methyl)-3-(morpholin-4-yl)-3-oxopropanoic acid

To a solution of 9.5 g (17.97 mmol) of the compound obtained in Step B in 40 mL of dioxane there are added, dropwise, 20 mL of a 4M solution of HCl in dioxane. The batch is
25 stirred at ambient temperature for 48 hours and then the solution is concentrated to dryness. After drying, the expected product is obtained in the form of an oil.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 12.75 (m, 1 H), 7.6 (2*d, 2 H), 7.3 (2*d, 2 H), 7.1/6.95 (2*m, 4 H), 4.7-4.2 (d, 2 H), 4.25/4.12 (2*m, 1 H), 3.9-3.3 (m, 9 H), 2.55 (d, 2 H), 2.3 (2*s, 3 H), 1.8 (t, 2 H)

IR (ATR) cm⁻¹: ν: -OH: 3500 to 2000; ν: >C=O: 1727 (acid); ν: >C=O: 1634 (amide); ν: -SO₂: 1330-1155

Step D: 3-[(3*R*)-2-[(4-Methylphenyl)sulphonyl]-1,2,3,4-tetrahydroisoquinolin-3-yl]-1-(morpholin-4-yl)propan-1-one

To a solution of 7.80 g (16.51 mmol) of the compound obtained in Step C in 100 mL of DMSO there are added 1.16 g (19.83 mmol) of solid sodium chloride (NaCl) and then, dropwise, 5 mL of water. The batch is stirred at 130°C for 1 hour and then the solution is concentrated to ¼. The reaction mixture is then diluted with dichloromethane and washed successively with saturated aqueous lithium chloride solution and then with brine. The organic phase is then dried over MgSO₄, filtered and concentrated to dryness. After purification by chromatography over silica gel using cyclohexane and ethyl acetate as eluants, the expected product is obtained in the form of an oil.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 7.65 (d, 2 H), 7.3 (d, 2 H), 7.15/7 (2 m, 4 H), 4.6 (d, 1 H), 4.25 (d, 1 H), 4.2 (m, 1 H), 3.5 (m, 4 H), 3.4 (2 m, 4 H), 2.6 (2 dd, 2 H), 2.35 (s, 3 H), 2.3 (m, 2 H), 1.5 (quad., 2 H)

IR (ATR) cm⁻¹: ν: >C=O: 1639; ν: -SO₂: 1331-1156; γ: >CH-Ar: 815-675

Step E: (3*R*)-2-[(4-Methylphenyl)sulphonyl]-3-[3-(morpholin-4-yl)propyl]-1,2,3,4-tetrahydroisoquinoline

To a solution of 6.0 g (14.0 mmol) of the compound obtained in Step D in 60 mL of MTBE and 14 mL of dichloromethane there are added 1.06 g (28 mmol) of LAH in portions over 5 minutes. The batch is stirred at ambient temperature for 15 hours. There are added, dropwise, 1.5 mL of water and stirring is carried out for 15 minutes. There are then added, dropwise, 1.5 mL of 5M sodium hydroxide solution and stirring is carried out for 15 minutes. The reaction mixture is then diluted with MTBE and dichloromethane. The suspension is then filtered and the precipitate is washed with MTBE and dichloromethane. The organic phase is then dried over MgSO₄, filtered and concentrated to dryness. After

purification by chromatography over silica gel using dichloromethane and ammonia-in-ethanol as eluants, the expected product is obtained in the form of an oil.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 7.68 (d, 2 H), 7.32 (d, 2 H), 7.1 (unresolved peak, 4 H), 4.65/4.23 (AB, 2 H), 4.2 (m, 1 H), 3.55 (t, 4 H), 2.7/2.6 (ABX, 2 H), 2.35 (s, 3 H),
5 2.25 (t, 4 H), 2.2 (t, 2 H), 1.4/1.3 (2m, 4 H).

IR (ATR) cm⁻¹: ν: -SO₂: 1333-1158

Step F: (3R)-3-[3-(Morpholin-4-yl)propyl]-1,2,3,4-tetrahydroisoquinoline

To a solution of 1.50 g (3.62 mmol) of the compound obtained in Step E in 20 mL of anhydrous methanol there are added 2.0 g (82.3 mmol), in portions, of magnesium
10 turnings. The batch is stirred in the presence of ultrasound for 96 hours. The reaction mixture is then filtered, the solid is washed several times with methanol, and the filtrate is concentrated to dryness. After purification by chromatography over silica gel using dichloromethane and ammonia-in-ethanol as eluants, the expected product is obtained in the form of an oil.

15 ¹H NMR (400 MHz, dms_o-d₆) δ ppm: 7.3 (d, 2 H), 7.1 (t, 2 H), 7.1 (d+t, 3 H), 7 (d, 2 H), 3.9 (s, 2 H), 3.55 (t, 4 H), 2.75 (m, 1 H), 2.72/2.45 (dd, 2 H), 2.35 (t, 4 H), 2.25 (t, 2 H), 1.6 (m, 2 H), 1.45 (m, 2 H)

IR (ATR) cm⁻¹: ν: >NH₂+ /NH+: 3500-2300; ν: >C-O-C<: 1115

High-resolution mass spectrometry (ESI⁺-/FIA/HR):

20 Empirical formula: C₁₆ H₂₄ N₂ O

[M+H]⁺ calculated: 261.1961

[M+H]⁺ measured: 261.1959

Preparation 7': (3*S*)-3-[(9*aS*)-Octahdropiperazino[2,1-*c*]morpholin-8-ylmethyl]-1,2,3,4-tetrahydroisoquinoline trihydrochloride

Step A: *tert*-Butyl (9*aS*)-4-oxo-octahdropiperazino[2,1-*c*]morpholine-8-carboxylate

The synthesis of this compound is known in the literature (*J. Med. Chem.* **2012**, *55*, 5887
5 for the opposite enantiomer).

Step B: (9*aS*)-Octahdropiperazino[2,1-*c*]morpholin-4-one hydrochloride

A 4M solution of HCl in dioxane (60 mL, 240 mmol) is added to the compound *tert*-butyl
(9*aS*)-4-oxo-octahdropiperazino[2,1-*c*]morpholine-8-carboxylate (11.8 g, 46.0 mmol)
cooled using an ice bath. The solution is then stirred at ambient temperature for 2 hours,
10 and then at 50-60°C for 1.5 hours. The solution is then evaporated to dryness. The residue
is co-evaporated with dioxane (3 x 20 mL) and then dried *in vacuo* to obtain the expected
compound in the form of a solid.

¹H NMR (400 MHz, dmso-*d*₆) δ ppm: 2.80 - 2.94 (m, 2 H), 2.94 - 3.05 (m, 1 H), 3.23 -
3.37 (m, 2 H), 3.59 - 3.69 (m, 1 H), 3.83 - 3.93 (m, 1 H), 3.95 - 4.04 (m, 1 H), 4.02 - 4.13
15 (m, 2 H), 4.45 - 4.55 (m, 1 H), 9.58 (br s, 2 H)

Step C: *tert*-Butyl (3*S*)-3-[(9*aS*)-4-oxo-octahdropiperazino[2,1-*c*]morpholine-8-carbonyl]-1,2,3,4-tetrahydroisoquinoline-2-carboxylate

EDC (3.90 g, 20.3 mmol) is added to a solution of the compound of Step B (3.02 g,
15.7 mmol), (3*S*)-2-[(*tert*-butoxy)carbonyl]-1,2,3,4-tetrahydroisoquinoline-3-carboxylic
20 acid (4.6 g, 16.6 mmol), triethylamine (8.0 mL, 57.4 mmol) and HOBt (2.72 g, 20.1 mmol)
in dichloromethane (150 mL). The mixture is stirred at ambient temperature for 21 hours.
1N aqueous HCl solution (105 mL) is added and the precipitate formed is filtered off using
a Buchner funnel. The phases of the filtrate are separated. The aqueous phase is extracted
with dichloromethane (2 x 10 mL). The combined organic phases are washed with 3N
25 aqueous HCl solution (35 mL), then with aqueous 5 % potassium bicarbonate solution (2 x
35 mL) and finally with brine (35 mL). The organic phase is dried over Na₂SO₄, filtered
and then concentrated under reduced pressure. The product is purified by chromatography
over silica gel using ethyl acetate and heptane as eluants to obtain the expected compound
in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 1.38 - 1.57 (m, 9 H), 2.39 - 2.89 (m, 2 H), 2.89 - 3.34 (m, 3 H), 3.34 - 3.70 (m, 2 H), 3.90 - 4.06 (m, 1 H), 4.09 - 4.27 (m, 2 H), 4.30 - 5.00 (m, 5 H), 5.20 - 5.37 (m, 1 H), 7.03 - 7.24 (m, 4 H)

Step D: (3*S*)-3-[(9*aS*)-Octahydropiperazino[2,1-*c*]morpholin-8-ylmethyl]-1,2,3,4-tetrahydroisoquinoline trihydrochloride

4M HCl solution in dioxane (45 mL, 180 mmol) is added to the compound of Step C (6.6 g, 46.0 mmol) cooled in an ice bath. The suspension is then stirred at ambient temperature for 24 hours and then it is evaporated to dryness. The residue is co-evaporated with MTBE and then dried *in vacuo*. The solid thereby obtained is suspended in tetrahydrofuran (160 mL), and then LiAlH₄ (3.0 g, 79.1 mmol) is added. The suspension is refluxed for 6.5 hours, and it is then cooled in an ice bath. Water (3 mL) is then added over a period of 7 minutes. After 0.5 hours, 2N aqueous sodium hydroxide solution (6 mL) is added. Water (6 mL) is again added 0.25 hours later. Finally, Celite (7 g) and Na₂SO₄ (25 g) are added 0.5 hours later. The suspension is filtered over Celite and rinsed with tetrahydrofuran (2 x 100 mL). The filtrate is concentrated to dryness. The oil thereby obtained is dissolved in MTBE (50 mL). The resulting solution is filtered and the filtrate concentrated. The residue is dissolved in methanol (60 mL), and then 4M HCl solution in dioxane (20 mL) is added. The solution is heated to 40°C and treated with activated charcoal (0.66 g), with stirring, for 1 hour. The suspension is filtered over Celite and rinsed with warm methanol. The filtrate is concentrated until the product starts to crystallise out. Crystallisation is allowed to continue for 16 hours at ambient temperature. The solid obtained is filtered off and rinsed with a mixture of 2-propanol / MTBE (4/6) (2 x 20 mL), and then with MTBE (2 x 20 mL). After drying, the expected compound is obtained.

¹H NMR (400 MHz, D₂O) δ ppm: 2.28 - 2.44 (m, 1 H), 2.74 - 3.00 (m, 4 H), 3.08 - 3.27 (m, 3 H), 3.27 - 3.42 (m, 2 H), 3.43 - 3.56 (m, 2 H), 3.56 - 3.69 (m, 2 H), 3.76 - 3.95 (m, 2 H), 4.00 - 4.22 (m, 2 H), 4.35 - 4.50 (m, 2 H), 7.20 - 7.41 (m, 4 H)

¹³C NMR (100 MHz, D₂O) δ ppm: 29.00, 44.58, 50.30, 51.08, 51.17, 52.75, 53.17, 58.08, 61.60, 64.61, 66.37, 127.14, 127.71, 128.00, 128.77, 129.55, 131.15

MS (ESI): [M+H]⁺ 288.16

Preparation 8': (3S)-3-(1-Oxa-6-azaspiro[3.3]hept-6-ylmethyl)-1,2,3,4-tetrahydro-isoquinoline

Step A: (3S)-3-(Iodomethyl)-2-[(4-methylphenyl)sulphonyl]-1,2,3,4-tetrahydro-isoquinoline

5 The compound of Step A of Preparation 6' (4.0 g; 8.48 mmol) in acetonitrile (10 mL) is placed in a 27-ml microwave tube and then sodium iodide (1.40 g; 9.33 mmol) is added. The reaction mixture is heated for 5 hours at 100°C using microwaves (200 W). It is then filtered and the solid is washed with dichloromethane. The filtrate is evaporated to dryness and then the residue is purified by chromatography over silica gel using heptane and ethyl
10 acetate as eluants. The title compound is obtained in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.64 (d, 2 H), 7.28 (d, 2 H), 7.15-7 (m, 4 H), 4.5/4.3 (2d, 2 H), 4.14 (m, 1 H), 3.22 (m, 2 H), 2.82 (m, 2 H), 2.31 (s, 3 H)

IR (ATR) cm⁻¹: 1897 ν -Ar, 1333 + 1156 ν -SO₂

Step B: (3S)-2-[(4-Methylphenyl)sulphonyl]-3-(1-oxa-6-azaspiro[3.3]hept-6-ylmethyl)-1,2,3,4-tetrahydroisoquinoline

15 The iodinated compound (2.5 g; 5.85 mmol) obtained in the preceding Step is dissolved in acetonitrile (50 mL). 1-Oxa-6-azaspiro[3.3]heptane oxalate (1.21 g; 6.36 mmol) is added, followed by potassium carbonate (1.61 g; 11.7 mmol). The reaction mixture is heated for 15 hours at reflux. The reaction mixture is filtered and washed with acetonitrile, and then is
20 evaporated to dryness.

The compound is purified by chromatography over silica gel using dichloromethane and ammonia-in-methanol as eluants. The title compound is obtained in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.68 (d, 2 H), 7.32 (d, 2 H), 7.14-7 (m, 4 H), 4.53/4.2 (dd, 2 H), 4.34 (t, 2 H), 3.95 (m, 1 H), 3.5/3.4/2.98 (3m, 4 H), 2.7 (t, 2 H), 2.68-
25 2.58 (m, 2 H), 2.34 (s, 3 H), 2.31-2.24 (m, 2 H)

IR (ATR) cm⁻¹: 1333 + 1156 ν -SO₂

Step C: (3S)-3-(1-Oxa-6-azaspiro[3.3]hept-6-ylmethyl)-1,2,3,4-tetrahydroisoquinoline

The tosylated compound of the above Step (1.3 g; 3.26 mmol) is dissolved in 10 mL of methanol. Powdered magnesium (633 mg; 26.08 mmol) is added in portions of 160 mg every 3 hours. The reaction mixture is stirred in an ultrasound bath 15 hours. It is then
5 filtered over Celite, washed with copious amounts of methanol, and then evaporated to dryness. The compound is purified by chromatography over silica gel using dichloromethane and ammonia-in-methanol as eluants. The compound is obtained in the form of an oil.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.01 (m, 4 H), 4.46 (t, 2 H), 3.85 (s, 2 H), 3.51/3.05
10 (dd, 2 H), 2.73 (t, 2 H), 2.61/2.4 (m, 4 H), 2.4 (m, 1 H), 2.4 (m, 1 H)

IR (ATR) cm⁻¹: 3325 ν >NH

Preparation 9': (3S)-3-[(9aR)-Octahdropiperazino[2,1-c]morpholin-8-ylmethyl]-1,2,3,4-tetrahydroisoquinoline trihydrochloride

Step A: tert-Butyl (9aR)-4-oxo-octahdropiperazino[2,1-c]morpholine-8-carboxylate

15 Synthesis of this compound is described in the literature (*J. Med. Chem.* **2012**, *55*, 5887).

Step B: (9aR)-Octahdropiperazino[2,1-c]morpholin-4-one hydrochloride

A 4M solution of HCl in dioxane (39 mL, 154 mmol) is added to the compound of Step A (11.3 g, 44.1 mmol). The solution is then stirred at ambient temperature for 5 hours, and then a 4M solution of HCl in dioxane (12 mL, 48 mmol) is added again. The mixture is
20 stirred for 16 hours. The solution is then evaporated to dryness to yield the expected product in the form of a solid.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 2.79 - 2.93 (m, 2 H), 3.02 (td, *J* = 13.1, 2.7 Hz, 1 H), 3.22 - 3.34 (m, 2 H), 3.59 - 3.67 (m, 1 H), 3.86 - 3.96 (m, 1 H), 3.96 - 4.01 (m, 1 H), 4.05 (AB q, *J* = 13.3 Hz, 2 H), 4.48 (dd, *J* = 14.1, 2.5 Hz, 1 H), 9.71 (br. s, 1 H), 9.91 (br.
25 s, 1 H)

Step C: *tert-Butyl (3S)-3-[(9aR)-4-oxo-octahydropiperazino[2,1-c]morpholine-8-carbonyl]-1,2,3,4-tetrahydroisoquinoline-2-carboxylate*

EDC (5.17 g, 27.0 mmol) is added to a solution of the compound of the above Step (4.0 g, 20.7 mmol), (3S)-2-[(*tert*-butoxy)carbonyl]-1,2,3,4-tetrahydroisoquinoline-3-carboxylic acid (6.04 g, 21.8 mmol), triethylamine (11.6 mL, 83.1 mmol) and HOBt (3.65 g, 27.0 mmol) in dichloromethane (100 mL). The mixture is stirred at ambient temperature for 16 hours. 1N aqueous HCl solution (70 mL) is added and the precipitate formed is filtered off using a Buchner funnel. The phases of the filtrate are separated. The organic phase is washed with saturated aqueous potassium carbonate solution and is then concentrated under reduced pressure. The residue is pre-absorbed onto silica gel and is purified by chromatography over silica gel using ethyl acetate and heptane as eluants to yield the expected compound in the form of a solid.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 1.25 - 1.58 (m, 9 H), 2.50 - 2.76 (m, 2 H), 2.76 - 3.25 (m, 3 H), 3.37 - 3.76 (m, 2 H), 3.92 - 4.50 (m, 5 H), 4.06 (s, 2 H), 4.66 (d, *J* = 15.6 Hz, 1 H), 4.76 - 5.28 (m, 1 H), 7.05 - 7.31 (m, 4 H)

Step D: *(3S)-3-[(9aR)-Octahydropiperazino[2,1-c]morpholin-8-ylmethyl]-1,2,3,4-tetrahydroisoquinoline trihydrochloride*

A 4M solution of HCl in dioxane (24.0 mL, 96.2 mmol) is added to a solution of the compound of Step C (8.00 g, 12.25 mmol) in dichloromethane (25 mL). The mixture is stirred at ambient temperature for 16 hours and is then concentrated to dryness. The crude product obtained is added to a suspension of LiAlH₄ (1.97 g, 51.91 mmol) in tetrahydrofuran (140 mL). The mixture is refluxed until the reaction (monitored by LC-MS) is complete and it is then cooled to 0°C. Water (2.5 mL) is added dropwise. After stirring for 10 minutes, aqueous 2M sodium hydroxide solution (5 mL) is added dropwise. Water (5 mL) is again added after stirring for 10 minutes. There are finally added Celite (4 g) and Na₂SO₄ (12 g) after stirring for an additional 10 minutes. The suspension is filtered over Celite and the filtrate is concentrated to dryness. The crude residue thereby obtained is dissolved in methanol (80 mL), and then a 4M solution of HCl in dioxane (16.75 mL, 67.0 mmol) is added. The mixture is stirred at ambient temperature for 3 hours, and then concentrated to dryness. The residue is dissolved in a minimum of warm

methanol (70 mL), and then MTBE (3-5 mL) is added. The solution is cooled at 0°C for 1 hour in an ice-cold water bath, and the product precipitates out. A little MTBE (2-3 mL) is again added and the mixture is allowed to stand for a further 1 hour at 0°C. The solid obtained is filtered over a Buchner funnel and dried *in vacuo* to yield the expected compound in the form of a solid.

¹H NMR (400 MHz, CD₃OD) δ ppm: 2.65 (t, *J* = 11.1 Hz, 1 H), 2.74 - 2.97 (m, 4 H), 3.10 (d, *J* = 12.5 Hz, 1 H), 3.19 (dd, *J* = 17.6, 4.8 Hz, 1 H), 3.25 - 3.55 (m, 5 H), 3.59 - 3.74 (m, 2 H), 3.82 - 4.15 (m, 4 H), 4.45 (AB q, *J* = 15.9 Hz, 2 H), 7.21 - 7.35 (m, 4 H).

¹³C NMR (100 MHz, CD₃OD) δ ppm: 30.21, 45.67, 50.22, 51.99, 52.90, 53.58, 53.71, 59.25, 62.58, 65.30, 67.07, 127.76, 128.40, 129.08, 129.36, 130.16, 131.95

MS (ESI): [M+H]⁺ 288.2

Preparation 1'': *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-methyl-pyrazol-4-amine

Step A: 4-[[*tert*-Butyl(dimethyl)silyl]oxy]aniline

The title compound is obtained starting from 4-aminophenol in THF in the presence of imidazole and *tert*-butyl(dimethyl)silyl chloride in accordance with the protocol described in the literature (S. Knaggs *et al*, *Organic & Biomolecular Chemistry*, 3(21), 4002-4010; 2005).

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 6.45-6.55 (dd, 4H, aromatic Hs); 4.60 (m, 2H, NH₂-Ph); 0.90 (s, 9H, Si (CH₂)₂CH(CH₃)₂); 0.10 (s, 6H, Si (CH₂)₂CH(CH₃)₂)

IR: ν: -NH₂⁺: 3300-3400 cm⁻¹

Step B: *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-methyl-pyrazol-4-amine

To a solution of 30.8 g (0.137 mol) of the compound of Step A in 525 mL of anhydrous toluene there are successively added 29.8 g of sodium *tert*-butylate (0.310 mol), 4.55 g of Pd₂(dba)₃ (also referred to as tris(dibenzylideneacetone)dipalladium(0)) (4.96 mmol), 4.81 g of 2-di-*tert*-butylphosphino-2',4',6'-tri-isopropyl-1,1'-biphenyl (9.91 mmol) and 12.8 mL of 4-bromo-1-methyl-1*H*-pyrazole (0.124 mol). The batch is degassed under

argon for 30 minutes and then refluxed for 3 hours. It is allowed to cool. The reaction mixture is concentrated to dryness and then taken up in dichloromethane, filtered over Celite and then concentrated to dryness again. The residue is then purified by chromatography over silica gel using dichloromethane and ethyl acetate as eluants to provide the expected product in the form of a solid.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.55 (s, 1H, pyrazole); 7.23 (s, 1H, pyrazole); 7.18 (broad s, 1H, NH₂-Ph); 6.64 (m, 4H, aromatic Hs); 3.77 (s, 3H, CH₃-pyrazole); 0.90 (s, 9H, Si (CH₂)₂CH(CH₃)₂); 0.12 (s, 6H, Si (CH₂)₂CH(CH₃)₂)

IR: ν -NH⁺: 3275 cm⁻¹; ν Ar and C=N: 1577 and 1502 cm⁻¹; ν -Si-C-: 1236 cm⁻¹; ν -Si-O-: 898 cm⁻¹; ν -Si-C-: 828, 774 cm⁻¹

Preparation 2'': 4-[[*tert*-Butyl(dimethyl)silyl]oxy]-*N*-phenylaniline

To a solution of 12 g of 4-anilinophenol (64.7 mmol) in 200 mL of acetonitrile there are added, at ambient temperature, 6.7 g of imidazole (97.05 mmol) and 11.7 g of *tert*-butyl(dimethyl)silyl chloride (77.64 mmol). The batch is stirred at 70°C for 4 hours. The reaction mixture is then poured into water and extracted with ether. The organic phase is then dried over MgSO₄, then filtered and evaporated to dryness. The crude product thereby obtained is then purified by chromatography over silica gel using petroleum ether and dichloromethane as eluants. The title product is obtained in the form of a powder.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.84 (s, 1H NH); 7.17 (t, 2H aniline); 6.98 (d, 2H phenoxy); 6.94 (d, 2H aniline); 6.76 (d, 2H phenoxy); 6.72 (t, 1H aniline); 0.95 (s, 9H *tert*-butyl); 0.15 (s, 6H dimethyl)

IR: ν : >NH: 3403 cm⁻¹; ν : >Ar: 1597 cm⁻¹

Preparation 3'': *tert*-Butyl 5-[(4-[[*tert*-butyl(dimethyl)silyl]oxy}phenyl)amino]-1*H*-indole-1-carboxylate

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by *tert*-butyl 5-bromo-1*H*-indole-1-carboxylate.

¹H NMR: δ (400 MHz; dms_o-d₆; 300K): 7.85 (d, 1H); 7.78 (s, 1H); 7.55 (d, 1H); 7.15 (d, 1H); 6.95 (m, 3H); 6.75 (d, 2H); 6.58 (d, 1H); 1.65 (s, 9H); 1.00 (s, 9H); 0.2 (s, 6H)

Preparation 4'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-methyl-1*H*-indol-5-amine

5 The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-1*H*-indole.

Preparation 5'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-methyl-1*H*-indazol-5-amine

10 The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-1*H*-indazole.

Preparation 6'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-3-fluoro-4-methylaniline

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 4-bromo-2-fluoro-1-methylbenzene.

15 **Preparation 7'':** *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-3-fluoroaniline

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 1-bromo-3-fluorobenzene.

Preparation 8'': 4-Benzoyloxy-*N*-phenyl-aniline

20 To a solution of 4-hydroxy-*N*-phenyl-aniline (30 g; 162 mmol) in acetonitrile (400 mL) there are added 58 g of Cs₂CO₃ (178 mmol) and stirring is carried out for 15 minutes at ambient temperature. Benzyl bromide (22.5 mL; 178 mmol) is then added dropwise and then the reaction mixture is refluxed for 4 hours. After filtering and rinsing with acetonitrile, the filtrate is concentrated and purified by chromatography over silica gel using petroleum ether and ethyl acetate as eluants. The title product is then obtained in the
25 form of a colourless solid.

¹H NMR: δ (400 MHz; dmso-d₆; 300K): 7.80 (m, 1H, NH); 7.45 (m, 2H, aryl); 7.40 (m, 2H, aryl); 7.30 (m, 1H, aryl); 7.15 (s, 2H, aryl); 7.05 (d, 2H, aryl); 6.9-7.0 (m, 4H, aryl); 6.70 (t, 1H, aryl); 5.05 (s, 2H, benzyl).

IR: ν: >NH: 3408 cm⁻¹

5 **Preparation 9'': N-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)pyridin-4-amine**

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 4-bromopyridine.

IR: ν -NH-: 3200 and 2500 cm⁻¹; ν:-Si-O-: 902 cm⁻¹; ν:-Si-C-: 820 cm⁻¹

Preparation 10'': N-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-4-fluoroaniline

10 The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 1-bromo-4-fluorobenzene.

Preparation 11'': N-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-amine

15 The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-1*H*-pyrrolo[2,3-*b*]pyridine (obtained in accordance with a protocol from the literature: *Heterocycles*, 60(4), 865, 2003).

IR: ν:-NH-: 3278 cm⁻¹; ν: aromatic -C=C- moieties: 1605 cm⁻¹

20 **Preparation 12'': N-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-2-methoxy-pyrimidin-5-amine**

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-2-methoxypyrimidine.

Preparation 13'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-amine

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-2,3-dihydro-1*H*-pyrrolo-
5 [2,3-*b*]pyridine.

Preparation 14'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-methyl-1*H*-benzimidazol-5-amine

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-1*H*-benzimidazole.

10 **Preparation 15'':** *N*⁴-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-*N*²,*N*²-dimethylpyridine-2,4-diamine

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 4-bromo-*N,N*-dimethylpyridin-2-amine.

15 **Preparation 16'':** *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)pyrazolo[1,5-*a*]-pyrimidin-6-amine

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 6-bromopyrazolo[1,5-*a*]pyrimidine.

IR: ν -NH-: 3272 cm⁻¹; ν -C=N-: 1634 cm⁻¹; ν -C=C-: 1616 cm⁻¹

20 **Preparation 17'':** *N*-[4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl]-1-methyl-pyrazolo[3,4-*b*]pyridin-5-amine

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-methyl-pyrazolo[3,4-*b*]pyridine (obtained in accordance with a protocol from the literature: WO 2006/052568 starting from 2-methyl-pyrazol-3-amine and 2-bromopropanedial).

Preparation 18'': 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1,5-dimethyl-1*H*-pyrrole-2-carbonitrile

Step A: 4-Bromo-1,5-dimethyl-1*H*-pyrrole-2-carbonitrile

A solution of bromine (6.58 mL, 0.13 mol) in acetic acid (60 mL) is added dropwise, with the aid of a dropping funnel, to a solution of 1,5-dimethyl-1*H*-pyrrole-2-carbonitrile (15.0 g, 0.12 mol) in acetic acid (300 mL). The batch is stirred at ambient temperature for 24 hours. The reaction mixture is then poured into a beaker containing 300 mL of water. The solid formed is filtered off and rinsed with water. It is then dissolved in dichloromethane (300 mL) and the organic phase is washed with brine, dried over Na₂SO₄, filtered and concentrated *in vacuo* to yield the expected product in the form of a solid.

¹H NMR (CDCl₃) δ ppm: 2.25 (s, 3 H), 3.67 (s, 3 H), 6.74 (s, 1 H)

Step B: 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1,5-dimethyl-1*H*-pyrrole-2-carbonitrile

A solution of the compound of the above Step (1.5 g, 7.53 mmol), 4-[(*tert*-butyldimethylsilyl)oxy]aniline (2.02 g, 9.04 mmol), sodium *tert*-butylate (1.45 g, 15.06 mmol) and 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (0.13 g, 0.30 mmol) in toluene (20 mL) is purged with nitrogen. Tris(dibenzylideneacetone)-dipalladium(0) (0.28 g, 0.30 mmol) is added, and then the reaction mixture is heated at 90°C until the reaction is complete (monitored by TLC). Heating is stopped and the mixture is allowed to return to ambient temperature. Water (75 mL) is added and the mixture is extracted with ethyl acetate (3 x 75 mL). The combined organic phases are washed with brine and then concentrated. The crude product is absorbed onto silica gel and purified by chromatography over silica gel using ethyl acetate and heptane as eluants. The product thereby obtained is dissolved in heptane in the warm state and is allowed to precipitate, with stirring, at ambient temperature, and then at 0°C. The solid is filtered off and the operation is repeated on the filtrate to yield the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.15 (s, 6 H), 0.97 (s, 9 H), 2.13 (s, 3 H), 3.66 (s, 3 H), 4.68 (br. s, 1 H), 6.49 (d, *J* = 8.5 Hz, 2 H), 6.64 (s, 1 H), 6.66 (d, *J* = 8.7 Hz, 2 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: 4.34, 9.72, 18.30, 25.88, 32.94, 101.27, 114.37, 114.70, 116.41, 120.73, 124.52, 131.23, 141.54, 148.27

5 MS (ESI⁺): [M+H]⁺ measured: 342.3

Preparation 19'': 4-[(4-{*tert*-Butyl(dimethyl)silyl}oxy)phenyl]amino]-1-methyl-1*H*-pyrrole-2-carbonitrile

Step A: 1-Methyl-1*H*-pyrrole-2-carbonitrile

10 *N,N*-Dimethylformamide (3 mL) and 1,4-diazabicyclo[2.2.2]octane (0.49 g, 4.3 mmol) are added to a solution of pyrrole-2-carbonitrile (4 g, 43.4 mmol) in dimethyl carbonate (56 mL). The solution is stirred at 90°C for 15 hours, and is then heated at 110°C for 8 hours. The mixture is cooled to ambient temperature, and then ethyl acetate (80 mL) is added. The phases are separated and the organic phase is washed with water (2 x 80 mL) and 1N aqueous HCl solution (1 x 80 mL). The combined aqueous phases are extracted
15 again with ethyl acetate (1 x 80 mL). The combined organic phases are washed with brine (1 x 80 mL), dried over MgSO₄, filtered and concentrated *in vacuo* to obtain the expected product in the form of a liquid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 3.78 (m, 2 H), 6.12 - 6.18 (m, 1 H), 6.74 - 6.82 (m, 1 H)

20 **Step B: 4-Bromo-1-methyl-1*H*-pyrrole-2-carbonitrile**

N-Bromosuccinimide (6.2 g, 34.9 mmol) is added to a solution of 1-methyl-1*H*-pyrrole-2-carbonitrile (3.7 g, 34.9 mmol) in *N,N*-dimethylformamide (150 mL). The solution is stirred for 15 hours at ambient temperature. Another amount of *N*-bromosuccinimide (2.0 g, 11 mmol) is added and the mixture is stirred for 3 hours. Silica (7 g) is then added
25 and the suspension is then evaporated to dryness. The material pre-absorbed onto the silica is placed on a silica gel column and the product is purified by chromatography over silica gel using ethyl acetate and heptane as eluants to obtain the expected product in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 3.77 (s, 3 H), 6.75 (d, *J* = 1.7 Hz, 1 H), 6.80 (d, *J* = 1.7 Hz, 1 H)

Step C: ***4-[(tert-Butyldimethylsilyl)oxy]phenyl}amino)-1-methyl-1H-pyrrole-2-carbonitrile***

5 Nitrogen is bubbled through a solution of 4-bromo-1-methyl-1H-pyrrole-2-carbonitrile (2.82 g, 15.2 mmol) and 4-[(*tert*-butyldimethylsilyl)oxy]aniline (4.08 g, 18.3 mmol) in toluene (55 mL) for 5 minutes. Sodium *tert*-butylate (2.92 g, 30.4 mmol), tris(dibenzylideneacetone)dipalladium(0) (556 mg, 0.6 mmol) and 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (255 mg, 0.6 mmol) are then added to the
10 reaction mixture. The mixture is stirred for 1 hour at 80°C under nitrogen. The suspension is then cooled to ambient temperature and filtered over Celite. The Celite cake is then rinsed with ethyl acetate. The filtrate is washed with water and then with brine. The organic phase is dried over MgSO₄, filtered and concentrated *in vacuo*. The product is purified twice by chromatography over silica gel using ethyl acetate and heptane as
15 eluants, and then by trituration in heptane to obtain the expected product in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.16 (s, 6 H), 0.97 (s, 9 H), 3.73 (s, 3 H), 6.57 (d, *J* = 1.9 Hz, 1 H), 6.64 - 6.66 (m, 1 H), 6.70 (s, 4 H); NMR

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.48, 18.17, 25.72, 35.46, 103.01, 113.56, 113.69,
20 115.92, 119.55, 120.67, 129.04, 139.94, 148.85

MS (ESI⁺): [M+H]⁺ 328.25

Preparation 20'': ***N-[4-[(tert-Butyl(dimethyl)silyl]oxy-3-fluoro-phenyl]-1-methyl-1H-pyrazol-4-amine***

25 The procedure is in accordance with the protocol of Preparation 1'', replacing the 4-aminophenol used in Step A by 2-fluoro-4-aminophenol.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 7.59 (bs, 1 H), 7.39 (m, 1 H), 7.24 (d, 1 H), 6.74 (dd, 1 H), 6.52 (dd, 1 H), 6.42 (ddd, 1 H), 3.76 (s, 3 H), 0.92 (s, 9 H), 0.1 (d, 6 H)

Preparation 21'': 2-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)pyridine-4-carbonitrile

A solution composed of 2-bromo-4-pyridinecarbonitrile (5.00 g, 36.1 mmol), 4-[(*tert*-butyldimethylsilyl)oxy]aniline (8.06 g, 36.1 mmol), sodium *tert*-butylate (4.50 g, 46.9 mmol) and 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (0.458 g, 1.08 mmol) in toluene (50 mL) is purged with nitrogen. Tris(dibenzylideneacetone)-dipalladium(0) (0.99 g, 1.08 mmol) is then added to the reaction mixture, and then the batch is heated at 50°C for 1.5 hours. The mixture is then allowed to cool to ambient temperature. Water is added and the reaction mixture is extracted with ethyl acetate (3 x 20 mL). The combined organic phases are washed with brine, and then concentrated under reduced pressure. The crude product is absorbed onto silica gel and purified by chromatography over silica gel using ethyl acetate and heptane as eluants. The product obtained is dissolved in the warm state in heptane and precipitates, with stirring, at ambient temperature, and then at 0°C. After filtration, the expected compound is obtained in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.22 (s, 6 H), 1.00 (s, 9 H), 6.61 (br. s, 1 H), 6.81 - 6.84 (m, 2 H), 6.84 - 6.89 (m, 2 H), 7.12 - 7.17 (m, 2 H), 8.26 (dd, *J* = 5.1, 0.9 Hz, 1 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.29, 18.31, 25.78, 109.11, 114.73, 117.23, 121.17, 121.74, 124.93, 132.12, 149.79, 153.45, 158.00

MS (ESI⁺): [M+H]⁺ 326.19

Preparation 22'': *N*-[4-[(*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-tetrahydrofuran-3-yl-pyrazol-4-amine

4-[(*tert*-Butyl(dimethyl)silyl)oxy]aniline (0.92 g, 3.48 mmol) and 4-iodo-1-tetrahydrofuran-3-yl-pyrazole (0.78 g, 3.48 mmol) dissolved in anhydrous tetrahydrofuran (20 mL) are stirred for one hour at ambient temperature in the presence of sodium *tert*-butylate (1.7 mL, 2M solution in THF) and chloro(2-di-*tert*-butylphosphino-2',4',6'-triisopropyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II) (84 mg, 0.122 mmol). The reaction mixture is filtered over Celite and then evaporated to dryness. The residue is crystallised from a mixture of heptane/ethyl acetate, filtered and washed with heptane and then purified

by chromatography over silica gel using dichloromethane and methanol as eluants to yield the expected product.

¹H NMR (500 MHz, dmso-d₆, 300 K) δ ppm: 7.62 (d, 1H, pyrazole-H5), 7.29 (d, 1H, pyrazole-H3), 7.26 (s, 1H, NH), 6.68 (d, 2H, Ar-H), 6.64 (d, 2H, Ar-H), 4.93 (m, 1H, THF-3'H), 3.95 (m, 1H, THF-5'H), 3.94 (m, 1H, THF-2'H), 3.87 (m, 1H, THF-2'H), 3.80 (m, 1H, THF-5'H), 2.33 (m, 1H, THF-4'H), 2.27 (m, 1H, THF-4'H), 0.93 (s, 9H, ^tBu), 0.12 (s, 6H, Me)

IR: ν C-H: 2857 cm⁻¹; ν aromatic: 1505 cm⁻¹; ν Si-C: 1249 cm⁻¹

Preparation 23'': 6-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)pyridine-2-carbonitrile

4-Aminophenol (3.3 g, 30.2 mmol) is added to a solution of 6-chloropyridine-2-carbonitrile (3.5 g, 25.3 mmol) in 1-methyl-2-pyrrolidinone (70 mL). The reaction mixture is heated at 140-150°C for 16 hours in a sealed flask. The batch is then cooled to ambient temperature. Imidazole (3.4 g, 49.9 mmol) and *tert*-butyl(dimethyl)silyl chloride (7.6 g, 50.4 mmol) are subsequently added and the mixture is stirred for 16 hours at ambient temperature. The mixture is diluted with water (140 mL) and the product is extracted with AcOEt (4 x 50 mL). The organic phases are combined and washed with water (3 x 50 mL), and then brine (1 x 50 mL). The organic phase is then dried over MgSO₄, filtered and concentrated *in vacuo*. The crude product is purified by chromatography over silica gel using ethyl acetate and heptane as eluants to obtain the title product.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.20 (s, 6 H), 0.99 (s, 9 H), 6.74 (dd, *J* = 7.6, 4.9 Hz, 1 H), 6.81 - 6.88 (m, 3 H), 7.36 - 7.42 (m, 2 H), 7.74 (dd, *J* = 7.6, 1.9 Hz, 1 H), 8.34 (dd, *J* = 4.9, 1.9 Hz, 1 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.38, 18.21, 25.73, 92.58, 113.50, 116.53, 120.30, 123.20, 131.97, 141.67, 152.42, 152.45, 156.51

MS (ESI): [M+H]⁺ 326.24

Preparation 24'': 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)pyrimidine-2-carbonitrile

Step A: *N*-{4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}-2-chloropyrimidin-4-amine

4-Aminophenol (8.8 g, 80.6 mmol) and triethylamine (18.6 mL, 133.4 mmol) are added to
5 a solution of 2,4-dichloropyrimidine (10.0 g, 67.1 mmol) in ethanol (150 mL). The reaction
mixture is heated at 150°C for 14 hours in a sealed flask. The batch is then cooled to
ambient temperature and the solvent is evaporated off *in vacuo*. Dichloromethane
(200 mL) is added to the residue, and then imidazole (9.1 g, 133.7 mmol) and *tert*-
butyl(dimethyl)silyl chloride (12.1 g, 80.3 mmol) are added. The mixture is stirred for 15
10 hours at ambient temperature. The reaction mixture is diluted with water (200 mL). The
phases are separated and the organic phase is washed with brine (1 x 100 mL). It is then
dried over MgSO₄, filtered and concentrated *in vacuo*. The residue is purified by
chromatography over silica gel using ethyl acetate and heptane as eluants to obtain a solid.
The latter is triturated in heptane, filtered off and rinsed with heptane to yield the expected
15 compound in the form of a solid.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 0.22 (s, 6 H), 0.99 (s, 9 H), 6.42 (d, *J* = 5.9 Hz, 1 H), 6.81 (br. s, 1 H), 6.85 - 6.90 (m, 1 H), 7.13 (d, *J* = 8.7 Hz, 2 H), 8.07 (d, *J* = 5.9 Hz, 2 H)

Step B: 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)pyrimidine-2-carbonitrile

20 Anhydrous *N,N*-dimethylformamide (10 mL) is placed under nitrogen in a flask and then
the compound of Step A (670 mg, 2.0 mmol) is added. Zinc cyanide (468 mg, 4.0 mmol)
and tetrakis(triphenylphosphine)palladium(0) (404 mg, 0.3 mmol) are subsequently added.
Nitrogen is bubbled through the solution for 5 minutes and then the reaction mixture is
stirred at 120°C for 2 hours under a nitrogen atmosphere. The reaction, monitored by LC-
25 MS, is complete. The mixture is cooled to ambient temperature, and then water (15 mL) is
added thereto. The product is extracted with AcOEt (3 x 25 mL). The organic phases are
combined and washed with water (4 x 25 mL), and then with brine (1 x 25 mL). The
organic phase is dried over MgSO₄, filtered and concentrated *in vacuo*. The residue is

purified by chromatography over silica gel using ethyl acetate and heptane as eluants to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.22 (s, 6 H), 0.99 (s, 9 H), 6.63 (d, *J* = 6.1 Hz, 1 H), 6.86 - 6.92 (m, 2 H), 7.03 (br. s, 1 H), 7.17 (d, *J* = 8.5 Hz, 2 H), 8.22 (d, *J* = 6.1 Hz, 1 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.51, 18.10, 25.55, 106.32, 115.92, 121.00, 125.22, 129.73, 144.55, 154.16, 156.07, 161.56

Preparation 25'': *N*-{4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}-1-trideuteriomethyl-1*H*-pyrazol-4-amine

Step A: 4-Bromo-1-trideuteriomethyl-1*H*-pyrazole

4-Bromo-1*H*-pyrazole (9.05 g, 61.6 mmol) is added in portions to a suspension of NaH (60 % in oil) (2.83 g, 70.8 mmol) in tetrahydrofuran (90 mL) cooled in an ice bath. After having taken away the ice bath, the solution is stirred at ambient temperature for 0.5 hours. It is again cooled in an ice bath and iodomethane-*d*₃ (5.0 mL, 80.3 mmol) is added. The solution is stirred at ambient temperature for 19 hours. The suspension is then concentrated. The evaporation residue is triturated with MTBE (90 mL) and filtered. The filtrate is concentrated *in vacuo* to obtain the expected compound in the form of an oil.

¹H NMR (400 MHz, CDCl₃) δ ppm: 7.37 (s, 1 H), 7.43 (s, 1 H)

Step B: *N*-{4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}-1-trideuteriomethyl-1*H*-pyrazol-4-amine

4-Bromo-1-trideuteriomethyl-1*H*-pyrazole (9.6 g, 58.5 mmol), 4-[(*tert*-butyldimethylsilyl)oxy]aniline (14.4 g, 64.6 mmol) and toluene (150 mL) are added to a 500-ml three-necked flask. The solution is degassed with nitrogen for 15 minutes, and then sodium *tert*-butylate (11.4 g, 0.12 mol), 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (0.77 g, 1.81 mmol) and tris(dibenzylideneacetone)dipalladium(0) (1.64 g, 1.79 mmol) are successively added. The suspension is heated at 85°C for 1.5 hours. The reaction mixture is then cooled to ambient temperature and water (270 mL) is added. The mixture is stirred for 30 minutes. Celite (30 g) is then added and the suspension is filtered on a bed of Celite.

The phases of the filtrate are separated and the aqueous phase is extracted with ethyl acetate (3 x 200 mL). The combined organic phases are dried over Na₂SO₄ and filtered. Silica (36 g) is added to the filtrate and the batch is evaporated to dryness. The product is purified by chromatography over silica gel using ethyl acetate and heptane as eluants. The product obtained is recrystallised from heptane (80 mL) to obtain the expected compound.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.16 (s, 6 H), 0.97 (s, 9 H), 4.92 (s, 1 H), 6.61 – 6.73 (m, 4 H), 7.25 (s, 1 H), 7.36 (s, 1 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.37, 18.28, 25.86, 38.67 (sept., ¹J_{C-D} = 21.0 Hz), 115.12, 120.73, 123.76, 126.52, 134.74, 141.07, 148.43

MS (ESI): [M+H]⁺ 307.08

Preparation 26'': *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-(oxetan-3-yl)-1*H*-pyrazol-4-amine

Step A: 4-Bromo-1-(oxetan-3-yl)-1*H*-pyrazole

4-Bromo-1*H*-pyrazole (1.53 g, 10.7 mmol) is dissolved in anhydrous dimethylformamide (15 mL). 3-Bromooxetane (2.0 g, 14.6 mmol) and caesium carbonate (4.7 g, 14 mmol) are successively added thereto. The reaction mixture is heated for 8 hours at 130°C in a sealed flask. At the end of the reaction, the solvent is evaporated off *in vacuo* and the residue is purified by chromatography over silica gel using dichloromethane containing diethylamine and methanol as eluants to yield the expected compound.

Step B: *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-(oxetan-3-yl)-1*H*-pyrazol-4-amine

4-[*tert*-Butyl(dimethyl)silyl]oxyaniline (1.5 g, 7.2 mmol) and 4-bromo-1-(oxetan-3-yl)-pyrazole (1.6 g, 7.2 mmol) dissolved in anhydrous tetrahydrofuran (25 mL) are stirred for 3 hours at ambient temperature in the presence of sodium *tert*-butylate (3.7 mL, 2M solution in THF) and chloro(2-di-*tert*-butylphosphino-2',4',6'-triisopropyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II) (101 mg, 0.145 mmol). The reaction mixture is filtered over Celite and then evaporated to dryness. The residue is purified by chromatography over silica gel using dichloromethane containing diethylamine and ethyl acetate as eluants to yield the expected product.

¹H NMR (500 MHz, dms_o-d₆, 300 K) δ ppm: 7.76 (s, 1H, pyrazole-5'H), 7.40 (s, 1H, pyrazole-3'H), 7.34 (br s, 1H, NH), 6.70 (d, 2H, Ar-H), 6.65 (d, 2H, Ar-H), 5.49 (m, 1H, oxetane), 4.89 (d, 4H, oxetane), 0.93 (s, 9H, ^tBu), 0.13 (s, 6H, Me)
IR: ν: C-H: 2955 cm⁻¹; aromatic: 1505 cm⁻¹; Si-C: 1237 cm⁻¹

5 **Preparation 27'': Mixture of *N*-(4-{{*tert*-butyl(dimethyl)silyl}oxy}phenyl)-1,5-dimethyl-1*H*-pyrazol-4-amine and *N*-(4-{{*tert*-butyl(dimethyl)silyl}oxy}phenyl)-1,3-dimethyl-1*H*-pyrazol-4-amine**

Step A: Mixture of 4-bromo-1,5-dimethyl-1*H*-pyrazole and 4-bromo-1,3-dimethyl-1*H*-pyrazole

10 To a suspension of NaH 60 % in oil (0.3 g; 7.45 mmol) in tetrahydrofuran (150 mL) there is added, at 10°C, 4-bromo-3-methyl-1*H*-pyrazole dissolved in 15 mL of tetrahydrofuran dropwise, over 15 minutes. After stirring for 40 minutes at ambient temperature, iodomethane (0.45 mL; 7.45 mmol) is added dropwise, and then the reaction mixture is stirred overnight. After adding water, the reaction mixture is evaporated and taken up in
15 dichloromethane. The organic phase is separated off and dried over MgSO₄, filtered and concentrated to dryness. The residue is purified by chromatography over silica gel to yield a mixture of the title compounds (4-bromo-1,3-dimethyl-pyrazole and 4-bromo-1,5-dimethyl-pyrazole respectively in a ratio of 4:6).

4-bromo-1,5-dimethyl-1*H*-pyrazole:

20 ¹H NMR (500 MHz, dms_o-d₆) δ ppm: 7.41 (s, 1 H), 3.76 (s, 3 H), 2.22 (s, 3 H)

4-bromo-1,3-dimethyl-1*H*-pyrazole:

¹H NMR (500 MHz, dms_o-d₆) δ ppm: 7.81 (s, 1 H), 3.74 (s, 3 H), 2.09 (s, 3 H)

Step B: Mixture of *N*-(4-{{*tert*-butyl(dimethyl)silyl}oxy}phenyl)-1,5-dimethyl-1*H*-pyrazol-4-amine and *N*-(4-{{*tert*-butyl(dimethyl)silyl}oxy}phenyl)-1,3-dimethyl-1*H*-pyrazol-4-amine

25 The procedure is in accordance with Step B of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole by the mixture of isomers from Step A. A mixture of isomers in a

ratio of 4:6 is obtained (respectively *N*-(4-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-1,5-dimethyl-1*H*-pyrazol-4-amine and *N*-(4-{[*tert*-butyl(dimethyl)silyl]oxy}phenyl)-1,3-dimethyl-1*H*-pyrazol-4-amine).

Preparation 28'': *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-cyclopropyl-1*H*-pyrazol-4-amine

Step A: 4-Bromo-1-cyclopropyl-1*H*-pyrazole

4-Bromo-1*H*-pyrazole (1.76 g, 12 mmol) is dissolved in anhydrous dimethylformamide (15 mL). Cyclopropyl bromide (2.9 mL, 36 mmol) and caesium carbonate (7.8 g, 24 mmol) are successively added thereto. The reaction mixture is heated for 15 hours at 160°C in a sealed flask. At the end of the reaction, the solvent is evaporated off *in vacuo* and the residue is purified by chromatography over silica gel using heptane and dichloromethane as eluants to yield the expected compound.

Step B: *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-cyclopropyl-1*H*-pyrazol-4-amine

4-[*tert*-Butyl(dimethyl)silyl]oxyaniline (1.64 g, 7.3 mmol) and 4-bromo-1-cyclopropyl-1*H*-pyrazole (1.4 g, 7.3 mmol) dissolved in anhydrous tetrahydrofuran (30 mL) are stirred for 3 hours at ambient temperature in the presence of sodium *tert*-butylate (3.7 mL, 2M solution in THF) and chloro(2-di-*tert*-butylphosphino-2',4',6'-triisopropyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II) (101 mg, 0.146 mmol). The reaction mixture is filtered over Celite and then evaporated to dryness. The residue is purified by chromatography over silica gel using heptane and ethyl acetate as eluants to yield the expected product.

¹H NMR (500 MHz, dms_o-d₆, 300 K) δ ppm: 7.61 (s, 1H, pyrazole-5'H), 7.23 (s, 1H, pyrazole-3'H), 7.22 (br s, 1H, NH), 6.65 (d, 2H, Ar-H), 6.63 (d, 2H, Ar-H), 3.64 (m, 1H, cyclopropyl-H), 1.00 – 0.91 (m, 4H, cyclopropyl), 0.93 (s, 9H, ^tBu), 0.12 (s, 6H, Me)

IR: ν: C-H: 2930 cm⁻¹; aromatic: 1504 cm⁻¹; Si-C: 1237 cm⁻¹

High-resolution mass spectrometry (ESI+):

Empirical formula: C₁₈H₂₇N₃OSi

[M+H]⁺ calculated: 330.2003

[M+H]⁺ measured: 330.1989

5 **Preparation 29'': 1,5-Dimethyl-4-(phenylamino)-1*H*-pyrrole-2-carbonitrile**

The procedure is in accordance with the protocol of Preparation 1'', replacing the 4-{{*tert*-butyl(dimethyl)silyl}oxy}aniline used in Step B by aniline.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 7.19 (s, 1 H), 7.05 (t, 2 H), 6.79 (s, 1 H), 6.6 (m, 3 H), 3.61 (s, 3 H), 2.1 (s, 3 H)

10 **Preparation 30'': 1-Methyl-*N*-phenyl-1*H*-pyrrolo[2,3-*b*]pyridin-6-amine**

The procedure is in accordance with the protocol of Step B of Preparation 1'' using aniline and 5-bromo-1-methyl-1*H*-pyrrolo[2,3-*b*]pyridine (obtained in accordance with a protocol from the literature: *Heterocycles*, 60(4), 865, 2003).

15 ¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.1 (d, 1 H), 7.9 (s, 1 H), 7.7 (d, 1 H), 7.45 (d, 1 H), 7.17 (t, 2 H), 6.9 (d, 2 H), 6.7 (t, 1 H), 6.38 (d, 1 H), 3.8 (s, 3 H)

Preparation 31'': *N*-(4-{{*tert*-Butyl(dimethyl)silyl}oxy}phenyl)-1-trideuteriomethyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-amine

20 The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 5-bromo-1-(trideuteriomethyl)-1*H*-pyrrolo[2,3-*b*]pyridine (obtained in accordance with a protocol from the literature *Heterocycles*, 60(4), 865, 2003, replacing the methyl iodide by trideuterated methyl iodide).

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.05 (d, 1 H), 7.6 (m+d, 2 H), 7.4 (d, 1 H), 6.85/6.7 (2d, 4 H), 6.3 (d, 1 H), 0.95 (s, 9 H), 0.15 (s, 6 H)

Preparation 32'': 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1-trideuteriomethyl-1*H*-pyrrole-2-carbonitrile

Step A: 1-Trideuteriomethyl-1*H*-pyrrole-2-carbonitrile

NaH (60 % in oil) (2.61 g, 65.2 mmol) is suspended in tetrahydrofuran (110 mL) at 0°C. 1*H*-Pyrrole-2-carbonitrile (5 g, 54.3 mmol) is added dropwise over 10 minutes. The reaction mixture is then warmed up to ambient temperature over 30 minutes. It is again cooled to 0°C, and then iodomethane-*d*₃ (10.23 g, 70.6 mmol) is added. The reaction mixture is stirred for 16 hours under nitrogen at ambient temperature. The reaction mixture is then evaporated under reduced pressure, and then ethyl acetate (200 mL) and water (200 mL) are added. The phases are separated, and the aqueous phase is extracted with ethyl acetate (2 x 200 mL). The combined organic phases are washed with brine (1 x 80 mL), dried over MgSO₄, filtered and concentrated *in vacuo*. The residue is purified by chromatography over silica gel using ethyl acetate and heptane as eluants. The fractions are combined and evaporated *in vacuo* to obtain the expected compound.

¹H NMR (400 MHz, CDCl₃) δ ppm: 6.13 (dd, *J* = 2.7, 3.9 Hz, 1 H), 6.75 (dd, *J* = 1.5, 4.1 Hz, 1 H), 6.79 (dd, *J* = 1.7, 2.6 Hz, 1 H)

Step B: 4-Bromo-1-trideuteriomethyl-1*H*-pyrrole-2-carbonitrile

N-Bromosuccinimide (6.68 g, 37.5 mmol) is added to a solution of the compound of the above Step (4.09 g, 37.5 mmol) in *N,N*-dimethylformamide (188 mL). The solution is stirred for 16 hours at ambient temperature. The residue is purified by chromatography using ethyl acetate and heptane as eluants to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 6.75 (d, *J* = 1.7 Hz, 1H), 6.80 (d, *J* = 1.7 Hz, 1 H)

Step C: 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1-trideuteriomethyl-1*H*-pyrrole-2-carbonitrile

Nitrogen is bubbled through a solution composed of the compound obtained in the above Step (5.85 g, 31.1 mmol), 4-[(*tert*-butyldimethylsilyl)oxy]aniline (8 g, 35.8 mmol), sodium

tert-butylate (3.88 g, 40.4 mmol) and 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (662 mg, 1.56 mmol) in toluene (260 mL) for 5 minutes. Tris(dibenzylideneacetone)-dipalladium(0) (1.43 g, 1.56 mmol) is then added. The mixture is stirred for 1 hour at 70°C under nitrogen. The suspension is then cooled to ambient temperature, diluted with ethyl acetate and filtered over Celite. The Celite cake is then rinsed with ethyl acetate. The filtrate is washed with water (3 times), and then brine (once). The organic phase is dried over Na₂SO₄, filtered and concentrated *in vacuo*. The product is purified twice by chromatography over silica gel using ethyl acetate and heptane as eluants, and then by reverse-phase chromatography using methanol and water as eluants to obtain the expected compound in the form of a powder.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.17 (s, 6 H), 0.98 (s, 9 H), 4.96 (br. s, 1 H), 6.57 (d, *J* = 1.9 Hz, 1 H), 6.64 (d, *J* = 1.8 Hz, 1 H), 6.70 (br. s, 4 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.38, 18.26, 25.83, 34.83, 102.96, 113.69, 113.71, 115.95, 119.58, 120.75, 129.14, 140.10, 148.84

MS (ESI): [M+H]⁺ 331.09

Preparation 33'': 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1-trideuterio-methyl-5-methyl-1*H*-pyrrole-2-carbonitrile

Step A: 5-Methyl-1*H*-pyrrole-2-carbonitrile

The compound is prepared in accordance with the protocol described in *Heterocycles* **2011**, 82, 1503.

Step B: 1-Trideuteriomethyl-5-methyl-1*H*-pyrrole-2-carbonitrile

A solution of 5-methyl-1*H*-pyrrole-2-carbonitrile (0.30 g, 2.82 mmol) in *N,N*-dimethyl-formamide (5 mL) is cooled to 0°C. NaH (60 % in oil) (0.118 g, 2.96 mmol) is added in portions, and the reaction mixture is stirred at 0°C for 30 minutes. Iodomethane-*d*₃ (4.15 mL, 67.2 mmol) is added in a single portion, and the reaction mixture is stirred at ambient temperature until the reaction is complete. It is then diluted with water (30 mL) and ethyl acetate (15 mL). The phases are separated and the aqueous phase is extracted a second time with ethyl acetate (15 mL). The combined organic phases are washed with

water (1 x 50 mL), and then brine, and dried over Na₂SO₄. After filtration and concentration under reduced pressure, the residue is purified by chromatography over silica gel using ethyl acetate and heptane as eluants to yield the expected compound in the form of a solid.

5 ¹H NMR (400 MHz, CDCl₃) δ ppm: 2.25 (s, 3 H), 5.91 (dd, *J* = 3.9, 0.6 Hz, 1 H), 6.69 (d, *J* = 3.9 Hz, 1 H)

Step C: 4-Bromo-1-trideuteriomethyl-5-methyl-1H-pyrrole-2-carbonitrile

10 A solution of bromine (0.133 mL, 2.60 mmol) in acetic acid (1.5 mL) is added dropwise to a solution of the compound obtained in the above Step (0.305 g, 2.48 mmol) in acetic acid (5.5 mL) previously cooled to 0°C. The reaction mixture is stirred and gradually warmed up to ambient temperature over a period of 20 hours. The reaction mixture is poured into water (50 mL) and the mixture is extracted with dichloromethane (2 x 50 mL). The organic phase is dried over Na₂SO₄, filtered and concentrated under reduced pressure to yield the expected compound in the form of a solid.

15 ¹H NMR (400 MHz, CDCl₃) δ ppm: 2.24 (s, 3 H), 6.73 (s, 1 H)

Step D: 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1-trideuteriomethyl-5-methyl-1H-pyrrole-2-carbonitrile

20 A solution composed of the compound obtained in the above Step (7.00 g, 34.6 mmol), 4-[(*tert*-butyldimethylsilyl)oxy]aniline (8.90 g, 39.8 mmol), sodium *tert*-butylate (4.33 g, 45.0 mmol) and 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (0.441 g, 1.04 mmol) in toluene (70 mL) is purged with nitrogen. Tris(dibenzylideneacetone)-dipalladium(0) (0.951 g, 1.04 mmol) is added, and then the reaction mixture is heated at 65°C until the reaction, monitored by TLC, is complete. Heating is stopped and the mixture is cooled to ambient temperature. Water (200 mL) is added and the mixture is
25 extracted with ethyl acetate (3 times). The combined organic phases are washed with brine, and then concentrated. The crude product is purified by chromatography over silica gel using ethyl acetate and heptane as eluants. The product obtained is dissolved in heptane in

the warm state; it is allowed to precipitate out at ambient temperature and then at 0°C to yield the expected product in the form of crystals.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.15 (s, 6 H), 0.96 (s, 9 H), 2.12 (s, 3 H), 4.66 (br. s, 1 H), 6.46 - 6.51 (m, 2 H), 6.64 (s, 1 H), 6.64 - 6.69 (m, 2 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.37, 9.64, 18.26, 25.84, 31.62 - 32.87 (m), 101.14, 114.35, 114.66, 116.33, 120.68, 124.51, 131.17, 141.53, 148.18

MS (ESI): [M+H]⁺ 345.13

Preparation 34'': 5-[(4-{[*tert*-Butyl(dimethyl)silyl]oxy}phenyl)amino]-1-methyl-1*H*-pyrazole-3-carbonitrile

Step A: 5-Amino-1-methyl-1*H*-pyrazole-3-carbonitrile

To a suspension of 1-methyl-5-nitro-1*H*-pyrazole-3-carbonitrile (2 g; 13.1 mmol) in a mixture of water (14 mL) and ethanol (120 mL) there are added HCl 37 % (170 μL) and iron filings (5.1 g; 91 mmol). The reaction mixture is heated for 5 hours at 50°C. After cooling to ambient temperature, the reaction mixture is filtered. The filtrate is concentrated to dryness and then purified by chromatography over silica gel using dichloromethane and ethyl acetate as eluants to yield the expected compound in the form of a solid.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 5.8 (s, 1 H), 5.7 (m, 2 H), 3.6 (s, 3 H)

Step B: 5-[(4-{[*tert*-Butyl(dimethyl)silyl]oxy}phenyl)amino]-1-methyl-1*H*-pyrazole-3-carbonitrile

The procedure is in accordance with the protocol of Step B of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole by (4-bromophenoxy)-(*tert*-butyl)dimethyl-silane and the 4-{[*tert*-butyl(dimethyl)silyl]oxy}aniline by the compound from Step A.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.15 (s, 1 H), 6.9 (d, 2 H), 6.75 (d, 2 H), 6.45 (s, 1 H), 3.75 (s, 3 H), 0.95 (s, 9 H), 0.15 (s, 6 H)

Preparation 35'': 4-[(4-{*tert*-Butyl(dimethyl)silyl}oxy)phenyl]amino]-5-methyl-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-2-carbonitrile

The procedure is in accordance with the process of Preparation 33'', replacing the iodomethane-*d*₃ in Step B by 2-(chloroethyl)morpholine hydrochloride.

5 ¹H NMR (400 MHz, dms_o-d₆) δ ppm: 6.85 (s, 1 H), 6.75 (s, 1 H), 6.6 (d, 2 H), 6.5 (d, 2 H), 4.1 (t, 2 H), 3.55 (t, 4 H), 2.6 (t, 2 H), 2.4 (t, 4 H), 2.1 (s, 3 H), 0.9 (s, 9 H), 0.1 (s, 6 H)

Preparation 36'': *N*-(4-{*tert*-Butyl(dimethyl)silyl}oxy)phenyl)-2-[2-(morpholin-4-yl)ethoxy]pyrimidin-5-amine

10 **Step A:** 4-[2-(5-Bromopyrimidin-2-yl)oxyethyl]morpholine

NaH (1.0 g, 25.0 mmol, 60 % in oil) suspended in anhydrous tetrahydrofuran is cooled at 0°C in an ice bath under argon, and then 2-morpholinoethanol (2.7 g, 20.7 mmol) is added dropwise. The ice bath is withdrawn and the suspension is stirred for 1 hour at ambient temperature. 5-Bromo-2-chloro-pyrimidine (4.0 g, 20.7 mmol) is then added at ambient
15 temperature and the reaction mixture is stirred for 16 hours at ambient temperature. Saturated aqueous ammonium chloride solution (10 mL) and water (10 mL) are added to the reaction mixture; the pH is adjusted to 9 by adding saturated aqueous NaHCO₃ solution. The resulting solution is extracted 3 times with ethyl acetate, the organic phase is then washed with brine, dried over MgSO₄, and then evaporated to dryness. The expected
20 compound precipitates out by means of the addition of petroleum ether.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.75 (s, 2 H), 4.4 (t, 2 H), 3.55 (t, 4 H), 2.7 (t, 2 H), 2.45 (t, 4 H)

IR (ATR) cm⁻¹: 1562 ν >C=C< and C=N, 787 ν -C-H Ar

25 **Step B:** *N*-(4-{*tert*-Butyl(dimethyl)silyl}oxy)phenyl)-2-[2-(morpholin-4-yl)ethoxy]pyrimidin-5-amine

The procedure is in accordance with the protocol of Step B of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole by the compound from Step A.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.3 (s, 2 H), 7.8 (s, 1 H), 6.9/6.75 (2d, 4 H), 4.35 (t, 2 H), 3.55 (t, 4 H), 2.7 (t, 2 H), 2.45 (t, 4 H), 0.95 (s, 9 H), 0.15 (s, 6 H)

IR (ATR) cm⁻¹: 3300 ν -NH, 1506 ν -NH, 837 ν -Si-Me, 837 and 778 ν -CH Ar

Preparation 37': 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1,3-dimethyl-1*H*-pyrrole-2-carbonitrile

Step A: 4-Methyl-*N*-(*prop*-2-*en*-1-yl)benzene-1-sulphonamide

Allylamine (10.6 mL, 0.14 mol) is added over a period of 4 minutes to a solution of tosyl chloride (25.1 g, 0.13 mol) in dichloromethane (250 mL) cooled in an ice bath. Triethylamine (24 mL, 0.18 mol) is added and then the solution is stirred at ambient temperature for 1.25 hours. Aqueous 3N HCl solution (60 mL) is added and the phases are then separated. The organic phase is washed with another amount of aqueous 3N HCl solution (60 mL) and then with 5 % aqueous sodium bicarbonate solution (60 mL). The organic phase is dried over Na₂SO₄, filtered and concentrated to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 2.43 (s, 3 H), 3.54 - 3.63 (m, 2 H), 4.50 (ls, 1 H), 5.05 - 5.22 (m, 2 H), 5.66 - 5.79 (m, 1H), 7.31 (d, *J* = 8.1 Hz, 2 H), 7.76 (d, *J* = 8.1 Hz, 2 H)

Step B: 4-Methyl-*N*-(2-methyl*prop*-2-*en*-1-yl)-*N*-(*prop*-2-*en*-1-yl)benzene-1-sulphonamide

3-Chloro-2-methylpropene (20 mL, 0.20 mol) is added over a period of 5 minutes to a suspension of 4-methyl-*N*-(*prop*-2-*en*-1-yl)benzene-1-sulphonamide (27.9 g, 0.13 mol) and potassium carbonate (28.1 g, 0.20 mol) in *N,N*-dimethylformamide (200 mL) cooled in an ice bath. After 20 minutes, the suspension is stirred at ambient temperature for 18 hours. The suspension is concentrated to dryness. The residue is taken up in ethyl acetate (250 mL) and water (110 mL). The aqueous phase is extracted with ethyl acetate (2 x 50 mL). The combined organic phases are washed successively with aqueous 3N HCl solution (50 mL), water (3 x 50 mL), aqueous 5 % potassium bicarbonate solution

(50 mL), and finally brine (50 mL). The organic phase is dried over Na₂SO₄, filtered and concentrated to obtain the expected compound in the form of an oil.

¹H NMR (400 MHz, CDCl₃) δ ppm: 1.69 (s, 3 H), 2.43 (s, 3 H), 3.70 (s, 2H), 3.75 - 3.79 (m, 2 H), 4.87 (d, *J* = 25.1 Hz, 1 H), 5.04 - 5.09 (m, 1 H), 5.09 - 5.12 (m, 1 H), 5.45 - 5.59 (m, 1H), 7.29 (d, *J* = 8.1 Hz, 2 H), 7.71 (d, *J* = 8.1 Hz, 2 H)

Step C: 3-Methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole

A solution of the compound obtained in Step B (15.2 g, 57.3 mmol) in toluene (550 mL) is heated at 80°C in the presence of (1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene)-dichloro(phenylmethylene)(tricyclohexylphosphine)ruthenium (Grubbs' catalyst, 2nd generation) (150 mg, 0.18 mmol) for 1 hour. 2,3-Dichloro-5,6-dicyano-*p*-benzoquinone (16.1 g, 70.9 mmol) is then added in one portion, and the solution is heated at 80°C for 24 hours. The solution is filtered over Celite, and the filtrate is concentrated *in vacuo*. The product is purified by chromatography over silica gel using ethyl acetate and heptane as eluants to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 2.02 (d, *J* = 1.0 Hz, 3 H), 2.39 (s, 3 H), 6.09 - 6.13 (m, 1H), 6.85 - 6.90 (m, 1 H), 7.03 - 7.07 (m, 1 H), 7.27 (d, *J* = 8.4 Hz, 2 H), 7.72 (d, *J* = 8.4 Hz, 2 H)

Step D: 3-Methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole-2-carbonitrile

Aluminium chloride (19.4 g, 0.15 mol) is added all at once to a solution of 3-methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole (13.0 g, 55.3 mmol) in 1,2-dichloroethane (230 mL) at ambient temperature. After stirring for 20 minutes, cyanogen bromide (11.11 g, 0.10 mol) is added in portions over a period of 20 minutes. After 4.5 hours, an additional amount of cyanogen bromide (1.94 g, 18.3 mmol) is added. After stirring for 17 hours at ambient temperature, the reaction mixture is poured slowly into a mixture of dichloromethane (300 mL) and water (600 mL) cooled to 0°C. The resulting mixture is stirred for 1 hour. Subsequently the phases are separated and the aqueous phase is extracted with dichloromethane (3 x 150 mL). The combined organic phases are washed

with water (2 x 150 mL) and brine (150 mL). The organic phase is dried over Na₂SO₄, filtered and concentrated *in vacuo* to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 2.18 (s, 3 H), 2.43 (s, 3 H), 6.17 (d, *J* = 3.2 Hz, 1 H), 7.33 - 7.39 (m, 3 H), 7.90 (d, *J* = 8.5 Hz, 2 H)

5 **Step E: 4-Bromo-3-methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole-2-carbonitrile**

N-Bromosuccinimide (12.0 g, 67.4 mmol) is added all at once to a suspension of 3-methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole-2-carbonitrile (14.45 g, 55.6 mmol) in *N,N*-dimethylformamide (60 mL) at ambient temperature. The mixture is stirred at ambient temperature for 29 hours and is then cooled in an ice bath. Saturated aqueous sodium
10 bisulphite solution (90 mL), water (90 mL) and ethyl acetate (250 mL) are then added. The phases are separated, and then the aqueous phase is extracted with ethyl acetate (2 x 70 mL). The combined organic phases are washed with 5 % aqueous potassium bicarbonate solution (90 mL), water (3 x 90 mL), and then brine (3 x 90 mL). The organic phase is dried over Na₂SO₄, filtered and concentrated *in vacuo*. The crude product is
15 purified by chromatography over silica gel using toluene and heptane as eluants to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 2.13 (s, 3 H), 2.45 (s, 3 H), 7.38 (d, *J* = 8.4 Hz, 2 H), 7.43 (s, 1 H), 7.92 (d, *J* = 8.4 Hz, 2 H)

Step F: 4-Bromo-1,3-dimethyl-1H-pyrrole-2-carbonitrile

20 Potassium hydroxide (3.65 g, 65.1 mmol) is added all at once to a suspension of 4-bromo-3-methyl-1-(4-methylbenzenesulphonyl)-1H-pyrrole-2-carbonitrile (4.66 g, 13.7 mmol) in methanol (95 mL) cooled using an ice bath. After 15 minutes, the suspension is stirred at ambient temperature for 17 hours. The methanol is evaporated to dryness. The evaporation residue is taken up in MTBE (25 mL) and washed with water (25 mL). The aqueous phase
25 is extracted with MTBE (2 x 25 mL). The combined organic phases are dried over Na₂SO₄, filtered and concentrated *in vacuo*. The residue obtained is dissolved in tetrahydrofuran (50 mL) and the solution is cooled using an ice bath. NaH (60 % in oil) (1.02 g, 25.5 mmol) is added. After 10 minutes, iodomethane (2.4 mL, 38.6 mmol) is also added.

The mixture is stirred at ambient temperature for 1.5 hours. The tetrahydrofuran is evaporated to dryness. The residue is taken up in dichloromethane and washed with water. The aqueous phase is extracted with dichloromethane. The combined organic phases are dried over Na₂SO₄, filtered and concentrated *in vacuo* to obtain the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 2.16 (s, 3 H), 3.71 (s, 3 H), 6.74 (s, 1 H)

Step G: 4-({4-[(*tert*-Butyldimethylsilyl)oxy]phenyl}amino)-1,3-dimethyl-1H-pyrrole-2-carbonitrile

4-Bromo-1,3-dimethyl-1H-pyrrole-2-carbonitrile (2.03 g, 10.2 mmol) and 4-[(*tert*-butyldimethylsilyl)oxy]aniline (3.41 g, 15.3 mmol) are dissolved in toluene (40 mL). The solution is degassed with nitrogen for 10 minutes. Sodium *tert*-butylate (1.18 g, 12.2 mmol), 2-di-*tert*-butylphosphino-2',4',6'-triisopropylbiphenyl (0.17 g, 0.41 mmol) and tris(dibenzylideneacetone)dipalladium(0) (0.187 g, 0.2 mmol) are then added. The mixture is heated at 100°C for 30 minutes and then cooled to ambient temperature. Water (50 mL) and Celite (6 g) are added. The suspension is filtered over Celite, and the filtrate is diluted with MTBE. The phases are separated and the aqueous phase is extracted with MTBE (2 x 50 mL). The combined organic phases are dried over Na₂SO₄ and filtered. The residue is purified by chromatography over silica gel using ethyl acetate and heptane as eluants followed by reverse-phase chromatography using methanol and water as eluants. The product obtained is lyophilised to provide the expected compound in the form of a solid.

¹H NMR (400 MHz, CDCl₃) δ ppm: 0.15 (s, 6 H), 0.98 (s, 9 H), 2.05 (s, 3 H), 3.70 (s, 3 H), 4.69 (br. s, 1 H), 6.55 - 6.57 (m, 2 H), 6.64 - 6.69 (m, 3 H)

¹³C NMR (100 MHz, CDCl₃) δ ppm: -4.37, 9.42, 18.27, 25.84, 35.50, 102.59, 113.77, 115.13, 120.72, 121.91, 126.77, 126.94, 140.98, 148.39

Preparation 38'': 4-[(4-[(*tert*-Butyl(dimethyl)silyl]oxy)phenyl]amino)-1-ethyl-5-methyl-1H-pyrrole-2-carbonitrile

The procedure is in accordance with the process of Preparation 33'', replacing the iodomethane-*d*₃ in Step B by iodoethane.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 6.85 (s, 1 H), 6.75 (s, 1 H), 6.6/6.5 (2d, 4 H), 4 (quad, 2 H), 2.1 (s, 3 H), 1.3 (s, 3 H), 0.9 (s, 9 H), 0.1 (s, 6 H)

Preparation 39'': *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-2-ethoxy-pyrimidin-5-amine

5 **Step A: 5-Bromo-2-ethoxy-pyrimidine**

5-Bromo-2-chloro-pyrimidine (5.0 g, 25 mmol) is dissolved in ethanol (55 mL) and sodium ethylate (1.81 g, 26.6 mmol) is added in portions. The reaction mixture is stirred for 15 hours at ambient temperature. When the reaction is complete, the solvent is evaporated off, water (200 mL) is added, and then the reaction mixture is extracted with
10 dichloromethane (2 x 100mL). The organic phase is dried over Na₂SO₄, and then evaporated to dryness to yield 5-bromo-2-ethoxy-pyrimidine.

Step B: *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-2-ethoxy-pyrimidin-5-amine

4-[*tert*-Butyl(dimethyl)silyl]oxyaniline (1.8 g, 8 mmol) and 5-bromo-2-ethoxy-pyrimidine (1.6 g, 8 mmol) dissolved in anhydrous tetrahydrofuran (30 mL) are stirred for 1 hour at
15 ambient temperature in the presence of sodium *tert*-butylate (4 mL, 2M solution in THF) and chloro(2-di-*tert*-butylphosphino-2',4',6'-triisopropyl-1,1'-biphenyl)[2-(2-aminoethyl)-phenyl]palladium(II) (111 mg, 0.16 mmol). The reaction mixture is filtered over Celite and then evaporated to dryness. The residue is triturated in heptane to obtain the expected compound after filtration.

20 ¹H NMR (500 MHz, dms_o-d₆, 300 K) δ ppm: 8.31 (s, 2H, pyrimidine-H), 7.80 (s, 1H, NH), 6.73 (d, 2H, Ar-H), 6.68 (d, 2H, Ar-H), 4.26 (q, 2H, CH₂CH₃), 1.31 (t, 3H, CH₂CH₃), 0.94 (s, 9H, ^tBu), 0.15 (s, 6H, Me)

IR: v: aromatic: 1504 cm⁻¹; Si-C: 1247 cm⁻¹; C-O-C: 1057 cm⁻¹

Preparation 40'': *tert*-Butyl 6-[(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)amino]-pyridin-3-yl carbonate

Step A: 6-Bromopyridin-3-yl *tert*-butyl carbonate

To a solution of 5 g of 6-bromopyridin-3-ol (28.7 mmol) and 7.53 g of di-*tert*-butyl dicarbonate (34.5 mmol) in 50 mL of tetrahydrofuran there is added 0.18 g of 4-dimethylaminopyridine (1.4 mmol). The mixture is stirred at ambient temperature for 6 hours and then concentrated. The residue obtained is dissolved in a mixture of ethyl ether and water. After separation of the phases, the separated-off organic phase is dried over MgSO₄ and concentrated to dryness. The title product is obtained in the form of a solid which is used in the next Step without being otherwise purified.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 8.4 (s, 1 H), 7.71 (s, 2 H), 1.5 (s, 9 H)

Step B: *tert*-Butyl 6-[(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)amino]pyridin-3-yl carbonate

To a solution of 2.79 g of the compound obtained in Step A (10.2 mmol) in 15 mL of toluene and 15 mL of tetrahydrofuran there are added 1.18 g of sodium *tert*-butylate (12.2 mmol), and then the batch is stirred under argon for 15 minutes. There is then added 0.35 g of palladium catalyst (0.5 mmol). The reaction mixture is then stirred at ambient temperature for 16 hours and then filtered. The filtrate is concentrated and taken up in a mixture of dichloromethane and water. The organic phase is separated off and then washed with water, dried over MgSO₄, filtered and concentrated to dryness. The crude product thereby obtained is purified by chromatography over silica gel using dichloromethane and ethyl acetate as eluants. The residue is then taken up in a minimum of isopropyl ether. The solid then obtained is filtered off, washed with ether and then dried. The title product is obtained in the form of a solid, which is subsequently used without being otherwise purified.

¹H NMR (400 MHz, dms_o-d₆) δ ppm: 9 (s, 1 H), 8.35 (wd, 1 H), 8.3 (wd, 1 H), 8 (wd, 1 H), 7.45 (dd, 1 H), 7.45 (wd, 1 H), 6.8 (d, 1 H), 6.4 (wd, 1 H), 3.8 (s, 3 H), 1.5 (s, 9 H)

Preparation 41'': 3-[4-[*tert*-Butyl(dimethyl)silyl]oxyanilino]benzonitrile

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 3-bromobenzonitrile.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 8.3 (s, 1 H), 7.3 (t, 1 H), 7.2/7.1 (2 dd, 2 H), 7.15 (t, 1 H), 7.05 (d, 2 H), 6.8 (d, 2 H), 0.95 (s, 9 H), 0.2 (s, 6 H)

Preparation 42'': 4-[4-[*tert*-Butyl(dimethyl)silyl]oxyanilino]thiophene-2-carbonitrile

The procedure is in accordance with the process of Preparation 1'', replacing the 4-bromo-1-methyl-1*H*-pyrazole used in Step B by 4-bromothiophene-2-carbonitrile.

¹H NMR (400 MHz, dmso-d₆) δ ppm: 8.35 (s, 1 H), 7.59 (wd, 1 H), 7.08 (wd, 1 H), 6.95 (d, 2 H), 6.75 (d, 2 H), 0.94 (s, 9 H), 0.16 (s, 6 H)

The amines NHR₃R₄ wherein R₃ and R₄, each independently of the other, represent an aryl or heteroaryl group are obtained in accordance with processes described in the literature (Surry D.S. *et al.*, *Chemical Science*, 2011, 2, 27-50, Charles M.D. *et al.*, *Organic Letters*, 2005, 7, 3965-3968). The reaction protecting the hydroxy function of the 4-anilinophenol described in Preparation 2'' can be applied to various secondary amines NHR₃R₄ (as defined hereinbefore) having one or more hydroxy functions, when they are available commercially. Alternatively, the secondary amines having at least one hydroxy substituent may be synthesised directly in a protected form, i.e. starting from reagents whose hydroxy function has been protected beforehand. Among the protecting groups, *tert*-butyl(dimethyl)silyloxy and benzyloxy are especially preferred.

Among the amines NHR₃R₄ having a hydroxy substituent that are used for synthesising the compounds of the invention there may be mentioned: 4-(4-toluidino)phenol, 4-(4-chloroanilino)phenol, 4-(3-fluoro-4-methylanilino)phenol, 4-[4-(trifluoromethoxy)anilino]phenol, 4-[4-hydroxyanilino]phenol, {4-[(1-methyl-1*H*-indol-6-yl)amino]phenyl}-methanol, 4-(2,3-dihydro-1*H*-indol-6-ylamino)phenol, 4-[(1-methyl-2,3-dihydro-1*H*-indol-6-yl)amino]phenol, 4-[(1-methyl-1*H*-indol-6-yl)amino]phenol, 4-[(1-methyl-1*H*-indol-6-yl)amino]cyclohexanol, 4-[(1-methyl-1,2,3,4-tetrahydro-6-quinoliny)amino]phenol, 4-[(4-methyl-3,4-dihydro-2*H*-1,4-benzoxazin-7-yl)amino]phenol, 4-[4-(diethylamino)anilino]-

phenol, 4-(2,3-dihydro-1*H*-inden-5-ylamino)phenol, 4-[(1-methyl-1*H*-indazol-5-yl)amino]phenol, 4-[(1'-methyl-1',2'-dihydrospiro[cyclopropane-1,3'-indol]-5'-yl)amino]phenol, 4-[(1,3,3-trimethyl-2,3-dihydro-1*H*-indol-5-yl)amino]phenol, 4-[4-methoxy-3-(trifluoromethyl)anilino]phenol, 4-[4-(methylsulphonyl)-3-(trifluoromethyl)anilino]phenol, 2-fluoro-4-[(1-methyl-1*H*-indol-5-yl)amino]phenol, 4-[(1-ethyl-1*H*-indol-5-yl)amino]phenol, 4-[(1-ethyl-2,3-dihydro-1*H*-indol-5-yl)amino]phenol, 4-[(1-isopropyl-2,3-dihydro-1*H*-indol-5-yl)amino]phenol, 4-(butylamino)phenol, 3-[(1-methyl-1*H*-indol-5-yl)amino]-1-propanol, 4-[(1-methyl-1*H*-indol-5-yl)amino]-1-butanol, 4-[(3-fluoro-4-methylphenyl)amino]phenol, 4-[(3-chloro-4-methylphenyl)amino]phenol, 4-[(4-fluorophenyl)amino]phenol, 4-[(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)amino]phenol, 4-[(4-fluorophenyl)amino]phenol, 4-[(2-fluorophenyl)amino]phenol, 4-[(3-fluorophenyl)amino]phenol, 4-[(2,4-difluorophenyl)amino]phenol, 4-[(3,4-difluorophenyl)amino]phenol, 3-[(4-hydroxyphenyl)amino]benzonitrile, 4-[(3-methoxyphenyl)amino]phenol, 4-[(3,5-difluorophenyl)amino]phenol, 4-[(3-methylphenyl)amino]phenol, 4-[(4-hydroxyphenyl)amino]benzonitrile, 4-[(3-chlorophenyl)amino]phenol, 4-(pyrimidin-2-ylamino)phenol, 4-[(cyclobutylmethyl)amino]phenol, 2-[(4-hydroxyphenyl)amino]benzonitrile, 4-[[[(1-methyl-1*H*-pyrazol-4-yl)methyl]amino]phenol, 4-[(cyclopropylmethyl)amino]phenol, 4-[[[(1-methyl-1*H*-pyrazol-3-yl)methyl]amino]phenol, 4-(but-2-yn-1-ylamino)phenol, 4-(pyrazin-2-ylamino)phenol, 4-(pyridin-2-ylamino)phenol, 4-(pyridazin-3-ylamino)phenol, 4-(pyrimidin-5-ylamino)phenol, 4-(pyridin-3-ylamino)phenol, 4-[(3,5-difluoro-4-methoxyphenyl)amino]phenol, 4-(pyridin-4-ylamino)phenol, 4-[(3-fluoro-4-methoxyphenyl)amino]phenol, 2-(phenylamino)pyrimidin-5-ol, 5-[(4-hydroxyphenyl)amino]-2-methoxybenzonitrile, 4-[[3-(trifluoromethyl)phenyl]amino]phenol and 4-(methylamino)phenol.

The hydroxy function(s) of the secondary amines listed above is (are) protected beforehand by a suitable protecting group prior to any coupling to an acid derivative of the compound of formula (VII) as defined in the preceding general process.

Preparation I: *tert*-Butyl [2-(3-iodo-4-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)ethyl]carbamate

Step A: 4-[2-(*tert*-Butoxycarbonylamino)ethyl]benzoic acid

tert-Butyl dicarbonate (1.64 g; 7.5 mmol) is dissolved in 1,4-dioxane (5 mL) and the solution is added to a well-stirred solution of 4-(2-aminoethyl)benzoic acid (1.0 g; 5 mmol) in 1M aqueous sodium hydroxide solution (25 mL) and 1,4-dioxane (10 mL), and the mixture is then stirred at ambient temperature for 3 hours. The 1,4-dioxane is removed by evaporation *in vacuo*, and then ethyl acetate (200 mL) is added to the residue. The pH of the aqueous phase is adjusted to 1.5 with 2M aqueous HCl solution. The organic phase is separated off and the aqueous phase is then extracted with ethyl acetate (100 mL). The combined organic extracts are washed with water, dried over Na₂SO₄ and evaporated to a volume of 10 mL. Heptane is added to the residue and then the solid precipitate is filtered off to yield the title compound.

¹H NMR (500 MHz, dms_o-d₆, 300K): 12.81 (br s, 1H, COOH), 7.85 (m, 2H, Ar-2' and 6'H), 7.31 (m, 2H, Ar-3' and 5'H), 6.91 and 6.51 (2x br s, 1H, NH), 3.16 (m, 2H, CH₂), 2.75 (t, 2H, CH₂), 1.35 and 1.31 (2 x br s, 9H, Bu^t); **¹³C NMR (125 MHz, dms_o-d₆, 300 K):** 167.8 (q), 156.0 (CH), 145.3 (q), 129.8 (2 x CH), 129.3 (2 x CH), 129.1 (q), 78.0 (q), 41.5 (CH₂), 35.9 (CH₂), 28.7 (CH₃)

Step B: 4-[2-(*tert*-Butoxycarbonylamino)ethyl]-2-iodo-benzoic acid

The compound of the above Step (0.88 g; 3.31 mmol), iodobenzene diacetate (1.07 g; 3.31 mmol), tetrabutylammonium iodide (1.22 g; 3.31 mmol), iodine (0.84 g; 3.31 mmol) and diacetoxypalladium (0.04 g; 0.165 mmol) are dissolved in 1,2-dichloroethane (8 mL), and the mixture is then heated in a microwave reactor at 80°C for 90 minutes. The cooled mixture is partitioned between saturated aqueous Na₂CO₃ solution (30 mL) and the original solvent. The organic phase is separated off and the aqueous residue is extracted with diethyl ether (2 x 15 mL). The pH of the resulting aqueous solution is adjusted to 2 with 2M aqueous HCl solution and the product is then extracted with ethyl acetate (2 x 75 mL). The organic phase is dried over Na₂SO₄ and evaporated. The crude product is purified by chromatography over silica gel to yield the mixture of regioisomers, which are separated

by preparative HPLC using water-TFA and acetonitrile as eluants. The pH of the appropriate combined fractions is adjusted to 5 with NaHCO₃, and then the acetonitrile is evaporated off under reduced pressure. The precipitate is recovered by filtration and then dried to yield the title compound.

5 ¹H NMR (500 MHz, dms^o-d₆, 300K): 13.16 (broad s, 1H, COOH), 7.81 (s, 1H, Ar-3'H), 7.66 (d, 1H, Ar-6'H), 7.29 (d, 1H, Ar-5'H), 6.89 (t, 1H, NH), 3.14 (t, 1H, CH₂), 2.69 (t, 1H, CH₂), 1.35 (s, 9H, Boc)

Step C: tert-Butyl [2-(3-iodo-4-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl}phenyl)ethyl]carbamate

10 The compound of the above Step (0.714 g; 1.82 mmol), TBTU (0.73 g; 2.28 mmol), *N*-ethyl-*N*-isopropyl-propan-2-amine (0.94 mL; 5.46 mmol) and *N,N*-dimethylpyridin-4-amine (22 mg) are stirred in dichloromethane (20 mL) for 5 minutes, and then (3R)-3-methyl-1,2,3,4-tetrahydroisoquinoline (0.282 g; 1.92 mmol) (*cf.* Preparation 1') is added. The mixture is stirred for three more hours. The reaction mixture is diluted with
15 dichloromethane (150 mL) and then washed with water (25 mL), dried over Na₂SO₄ and evaporated. The crude product is purified by chromatography over silica gel using dichloromethane and methanol as eluants to yield the title compound.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₂₄H₂₉IN₂O₃

20 [M+H]⁺ calculated: 521.1303

[M+H]⁺ measured: 521.1282

IR: ν: C-H: 2931 cm⁻¹; >C=O: 1706, 1627 cm⁻¹; amide: 1505 cm⁻¹; C-O-C: 1248, 1166 cm⁻¹

Preparation II: *tert*-Butyl (4-Iodo-3-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}benzyl)carbamate

Step A: 2-Iodo-5-methyl-benzoic acid

3-Methylbenzoic acid (6.12 g; 45 mmol), iodobenzene diacetate (14.49 g; 45 mmol),
5 tetrabutylammonium iodide (16.62 g, 45 mmol), iodine (11.43 g; 45 mmol) and
diacetoxypalladium (0.5 g; 2.2 mmol) are dissolved in 1,2-dichloroethane, and then the
mixture is heated in a sealed tube at 85°C for 1 hour and 45 minutes. The cooled solution is
purified by chromatography over silica gel using dichloromethane and methanol as eluants
to yield the title compound.

10 **Step B: Methyl 2-iodo-5-methyl-benzoate**

The compound of the above Step (6.25 g, 23.9 mmol) is dissolved in anhydrous methanol
(100 mL), and then SOCl₂ (3.6 mL, 49 mmol) is added dropwise to the well-stirred
solution. The solution is refluxed for 18 hours and then evaporated to a volume of 25 mL
and then poured into crushed ice (100 g). The resulting mixture is extracted with diethyl
15 ether (2 x 75 mL). The organic phase is washed with saturated aqueous NaHCO₃ solution
and then brine, dried over Na₂SO₄ and evaporated to dryness to yield the title compound.

Step C: Methyl 5-(bromomethyl)-2-iodo-benzoate

The compound of the above Step (5.7 g; 20.7 mmol), *N*-bromo-succinimide (3.67 g;
20.7 mmol) and dibenzoyl peroxide (0.24 g; 1 mmol) are dissolved in carbon tetrachloride
20 (40 mL) and then refluxed for 5 hours. New portions of *N*-bromosuccinimide (1.0 g;
5.6 mmol) and dibenzoyl peroxide (0.05 g; 0.2 mmol) are then added and heating is
continued for 4 more hours. The reaction mixture is cooled to ambient temperature. The
insoluble parts are removed by filtration, and the concentrated filtrate is then purified by
chromatography over silica gel using heptane and ethyl acetate as eluants to yield the title
25 compound.

Step D: Methyl 5-(aminomethyl)-2-iodo-benzoate

The compound of the above Step (0.53 g; 1.5 mmol) is dissolved in 7M methanolic
ammonia (20 mL) and then stirred at ambient temperature for 1 hour. The solution is

evaporated to dryness to yield the title compound, which was used in the next Step without purification.

Step E: 5-[(tert-Butoxycarbonylamino)methyl]-2-iodo-benzoic acid

Methyl 5-(aminomethyl)-2-iodo-benzoate hydrobromide (0.56 g; 1.5 mmol) was dissolved in pyridine (10 mL), then di-*tert*-butyl dicarbonate (0.80 g; 3.6 mmol) is added and the mixture is stirred at ambient temperature for 30 minutes and then evaporated to dryness. The residue is redissolved in methanol (10 mL), and then 2M aqueous NaOH solution (3 mL) and 2 mL of water are added. The resulting solution is stirred for 2 hours at 50°C, then diluted with water (20 mL), and the methanol is evaporated off under reduced pressure. The pH of the resulting aqueous solution is adjusted to 3 with 2M aqueous HCl solution; the product is then extracted with ethyl acetate. The organic phase is washed with brine, and then dried over Na₂SO₄ and evaporated to dryness. The crude product is triturated with DCM. The solid formed is recovered by filtration to yield the title compound.

¹H NMR (500 MHz, dmso-d₆, 300 K): 13.24 (broad s, 1H, COOH), 7.91 (d, 1H, Ar-3'H), 7.58 (d, 1H, Ar-6'H), 7.47 (t, 1H, NH), 7.09 (d, 1H, (Ar-5'H), 4.09 (d, 2H, CH₂), 1.38 (s, 9H, Boc); **¹³C NMR (125 MHz, dmso-d₆, 300K):** 168.6 (q), 156.3 (q), 141.1 (q), 140.9 (CH), 137.1 (q), 131.6 (CH), 129.1 (CH), 92.2 (q), 78.5 (q), 28.7 (CH₃)

Step F: tert-Butyl (4-iodo-3-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-benzyl)carbamate

The compound of the above Step (1.62 g; 4.3 mmol), TBTU (2.76 g; 8.59 mmol), *N*-ethyl-*N*-isopropyl-propan-2-amine (1.48 mL; 8.59 mmol) and *N,N*-dimethylpyridin-4-amine (10 mg) are stirred in DCM (50 mL) for 5 minutes; (3R)-3-methyl-1,2,3,4-tetrahydroisoquinoline (0.76 g; 5.15 mmol) (*cf.* Preparation 1') is then added and the mixture is stirred for 15 minutes more. The insoluble parts are removed by filtration, and then the concentrated filtrate is purified by chromatography over silica gel using dichloromethane and methanol as eluants to yield the title compound.

Preparation III: *tert*-Butyl (3-bromo-4-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}benzyl)carbamate

Step A: Methyl 4-(aminomethyl)-2-bromo-benzoate

A solution of methyl 2-bromo-4-(bromomethyl)benzoate (4.57 g; 14.84 mmol) in 50 mL of methanol is added dropwise to a well-stirred solution of ammonia in methanol (7M; 315 mL) at ambient temperature, and the solution is then stirred for 3 hours. All the solvents are evaporated off and the residue is purified by chromatography over silica gel using dichloromethane-methanol as eluants to yield the title compound.

Step B: 2-Bromo-4-[(*tert*-butoxycarbonylamino)methyl]benzoic acid

The compound of the above Step (4.04 g; 16.6 mmol) is dissolved in pyridine (55 mL) and then di-*tert*-butyl dicarbonate (5.43 g; 24.9 mmol) is added and the mixture is stirred at ambient temperature for 16 hours; it is then evaporated to dryness. The residue is redissolved in methanol (100 mL), and then 1M aqueous NaOH solution (54 mL) is added. The resulting solution is stirred for 1.5 hours at 50°C and is then allowed to cool to ambient temperature. The pH of the solution is adjusted to 7 using 2M aqueous HCl solution; the methanol is then evaporated off under reduced pressure. The resulting aqueous solution is diluted with water (50 mL), and then the pH is adjusted to 3 using 2M aqueous HCl solution. The product is extracted with dichloromethane (2 x 100 mL). The organic phase is washed with brine, then dried over Na₂SO₄ and evaporated to dryness to yield the title compound which is used in the next Step without purification.

IR: ν : N-H: 3359 cm⁻¹; C-H: 2983 cm⁻¹; >C=O: 1685, 1603 cm⁻¹; amide: 1519 cm⁻¹; C-O-C: 1248, 1162, 1057 cm⁻¹

Step C: *tert*-Butyl (3-bromo-4-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}benzyl)carbamate

The compound of the above Step (3.7 g; 11.2 mmol), TBTU (7.19 g; 22.4 mmol), *N*-ethyl-*N*-isopropyl-propan-2-amine (3.86 mL; 22.4 mmol) and *N,N*-dimethylpyridin-4-amine (48 mg) are stirred in dichloromethane (100 mL) for 5 minutes, and then (3*R*)-3-methyl-1,2,3,4-tetrahydroisoquinoline (1.98 g, 13.44 mmol) (cf. Preparation 1') is added, and the

mixture is stirred for 1 hour more. The insoluble parts are removed by filtration, and then the concentrated filtrate is purified by chromatography over silica gel using dichloromethane and methanol as eluants to yield the title compound.

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₂₃H₂₇BrN₂O₃

[M+H]⁺ calculated: 459.1285

[M+H]⁺ measured: 459.1282

¹H NMR (500 MHz, dms_o-d₆, 300K, presence of amide rotamers): 7.66-6.87 (m, 7H, aromatic), 5.34 and 4.12 (d, 2H, CH₂-isoquinoline), 5.02 and 4.97 and 3.87 and 3.83 (m, 10 1H, CH₂-isoquinoline), 4.17 (d, 2H, CH₂-benzyl), 3.18-2.48 (m, 1H, CH₂-isoquinoline), 1.16 and 1.14 and 1.10 and 0.98 (d, 3H, isoquinoline CH₃), 1.31 and 1.41 (s, 9H, Boc).

Example 1. 5-(5-Chloro-2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

15 **Step A:** Ethyl 5-(5-chloro-2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-1,2-dimethyl-1H-pyrrole-3-carboxylate

To a solution of 1.4 g of the compound obtained in Preparation 1 (4.35 mmol) in 50 mL of dichloromethane there are successively added 0.7 g of the compound obtained in Preparation 1' (4.79 mmol), 0.7 g of HOBT (5.22 mmol), 0.81 g of EDC (5.22 mmol) and 20 1.6 mL of triethylamine (21.7 mmol). The batch is then stirred overnight at ambient temperature. The reaction mixture is then diluted with dichloromethane and washed 3 times with saturated aqueous NaHCO₃ solution. The organic phase is then dried over MgSO₄, filtered, concentrated to dryness, and then purified by chromatography over silica gel using dichloromethane and methanol as eluants.

25 ¹H NMR: δ (500 MHz; dms_o-d₆; 300K): 7.6-7.3 (m, 3H, aromatic Hs, 4-chlorophenyl); 7.2-6.85 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 6.45-6.3 (m, 1H, H pyrrole); 5.0-4.8-3.8 (m, 1H, aliphatic H, tetrahydroisoquinoline); 5.3-3.75 (dd, 2H, aliphatic Hs

tetrahydroisoquinoline); 4.2-4.0 (m, 2H, OCH₂CH₃); 3.25 (s, 3H, CH₃-N-pyrrole); 3.0-2.2 (m, 2H, aliphatic Hs, tetrahydroisoquinoline); 2.5 (s, 3H, CH₃-pyrrole); 1.25 (t, 3H, OCH₂CH₃); 1.05 (d, 3H, tetrahydroisoquinoline-CH₃)

IR: ν : >C=O: 1693 cm⁻¹ ester; ν : >C=O: 1625 cm⁻¹ amide

5 **Step B:** *5-(5-Chloro-2-((3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl)carbonyl)-phenyl)-1,2-dimethyl-1H-pyrrole-3-carboxylic acid*

To a solution of 1.7 g of the compound obtained in Step A (3.77 mmol) in 5 mL of dioxane there is added 0.317 g of LiOH (7.5 mmol) dissolved in 5 mL of water. The batch is heated in a microwave apparatus for 4 hours at 100°C (power 140 W). The reaction mixture is
10 then filtered and concentrated to dryness. The residue thereby obtained is taken up in dichloromethane (50 mL) and then saturated aqueous NH₄Cl solution is added thereto. The organic phase is washed with water and then with brine, dried over MgSO₄, filtered and concentrated to dryness. The title product is obtained in the form of a solid and is used directly in the next Step.

15 ¹H NMR: δ (500 MHz; dmso-d₆; 300K): 11.05 (broad s, 1H, COOH), 7.5-7.2 (m, 3H, aromatic Hs, 4-chlorophenyl); 7.2-6.9 (m, 4H, aromatic Hs, tetrahydroisoquinoline); 6.45-6.2 (m, 1H, aliphatic H, H pyrrole); 5.3-3.75 (dd, 2H, aliphatic Hs, tetrahydroisoquinoline); 5.0-4.8-3.8 (m, 1H, aliphatic H, tetrahydroisoquinoline); 3.5-3.2 (s, 3H, CH₃-N-pyrrole); 3.0-2.1 (aliphatic Hs, CH₃-tetraisoquinoline); 2.5-2.4-1.98 (m, 3H, CH₃-pyrrole); 1.05-
20 0.52 (m, 3H, aliphatic Hs, CH₃-tetraisoquinoline)

IR : ν : -OH: 3500-2000 cm⁻¹ carboxylic acid; ν : >C=O: 1699 + 1658 cm⁻¹ carboxylic acid; ν : >C=N-: 1625 cm⁻¹ amide

25 **Step C:** *N-(4-((tert-Butyl(dimethyl)silyl)oxy)phenyl)-5-(5-chloro-2-((3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl)carbonyl)phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide*

To a solution of 0.65 g of the compound obtained in Step B (1.54 mmol) in 15 mL of dichloroethane there is added, dropwise, 0.244 mL of 1-chloro-N,N,2-trimethyl-prop-1-en-1-amine. The reaction mixture is stirred at ambient temperature for 1 hour, and there are then added 0.56 g of the compound of Preparation 1" (1.84 mmol), 10 mL of

dichloroethane and 0.376 g of 4-dimethylaminopyridine (DMAP) (3.07 mmol). The batch is stirred at 110°C overnight. The reaction mixture is concentrated, dissolved in dichloromethane and washed with saturated aqueous NaHCO₃ solution. The title product is obtained in the form of an oil and is used directly in the next Step.

5 **Step D:** ***5-(5-Chloro-2-(((3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl)carbonyl)-phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide***

To a solution of 0.8 g of the compound obtained in Step C (1.03 mmol) in 2 mL of methanol, there are added 1.55 mL of a 1M solution of potassium hydroxide in methanol
10 (1.55 mmol). The batch is stirred at ambient temperature for 30 minutes. The reaction mixture is then diluted with dichloromethane and successively washed with 1M aqueous HCl solution, saturated aqueous NaHCO₃ solution and then brine until neutral. The organic phase is then dried over MgSO₄, filtered and evaporated. The crude product thereby obtained is purified by chromatography over silica gel using dichloromethane and
15 methanol as eluants. The solid thereby obtained is dissolved in a mixture of water/acetonitrile until dissolution is complete, filtered and then lyophilised.

Elemental microanalysis: (% , theoretical:measured)

%C=68.74:68.25; %H=5.43:5.69; %N=11.79:11.66; %Cl=5.97:5.95

High-resolution mass spectrometry (ESI+):

20 Empirical formula: C₃₄H₃₂ClN₅O₃

[M+H]⁺ calculated: 594.2266

[M+H]⁺ measured: 594.2289

Example 2. 5-(2-{{(3S)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-1-methyl-N,N-diphenyl-1H-pyrrole-3-carboxamide

Step A: *tert*-Butyl {{{(3S)-2-{2-[4-(diphenylcarbamoyl)-1-methyl-1H-pyrrol-2-yl]benzoyl}-1,2,3,4-tetrahydroisoquinolin-3-yl}methyl}carbamate

5 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 2 and *tert*-butyl [(3S)-1,2,3,4-tetrahydroisoquinolin-3-ylmethyl]carbamate (see Preparation 2') in Step A, and *N*-phenylaniline in Step C.

Step B: 5-(2-{{(3S)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-1-methyl-N,N-diphenyl-1H-pyrrole-3-carboxamide

10 A solution of the NH-Boc compound of Step A in dichloromethane is placed at 0°C. 10 molar equivalents of trifluoroacetic acid are added thereto dropwise. The batch is stirred at ambient temperature for 4 hours until the starting material has disappeared completely. The reaction mixture is then concentrated to dryness, taken up again and co-evaporated twice with toluene, then taken up in a mixture of acetonitrile/H₂O and finally lyophilised.

15 The title product is then obtained after a neutralisation step.

Elemental microanalysis: (% theoretical:measured)

%C=77.75:77.27; %H=5.97:5.73; %N=10.36:10.44

Example 3. 5-(5-Chloro-2-{{(3S)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(4-hydroxyphenyl)-N-(1H-indol-5-yl)-1-methyl-1H-pyrrole-3-carboxamide

Step A: *tert*-Butyl 5-[(4-{{tert-butyl(dimethyl)silyl}oxy}phenyl){5-(5-chloro-2-{{(3S)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-1-methyl-1H-pyrrol-3-yl}carbonyl]amino-1H-indole-1-carboxylate

25 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 3 and (3S)-3-[(4-methyl-1-piperazinyl)methyl]-1,2,3,4-tetrahydroisoquinoline (see Preparation 4') in Step A, and the compound of Preparation 3" in Step C.

Step B: 5-(5-Chloro-2-{[(3S)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-N-(1H-indol-5-yl)-1-methyl-1H-pyrrole-3-carboxamide

To a solution of 455 mg (0.49 mmol) of the product obtained in Step A in 5 mL of methanol there are added 135 mg (2.5 mmol) of KOH. After stirring for 3 hours at ambient temperature, the reaction mixture is concentrated, treated with saturated aqueous NaHCO₃ solution and extracted with methylene chloride. The organic phase is then dried over MgSO₄, filtered and evaporated to dryness. The crude product thereby obtained is then purified by chromatography over silica gel using dichloromethane and methanol as eluants to yield the expected product in the form of a foam.

Elemental microanalysis: (% , theoretical:measured)

%C=70.72:68.54; %H=5.79:5.37; %N=11.78:11.41; %Cl=4.97:4.79

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂H₄₁ClN₆O₃

[M+H]⁺ calculated: 713.3007

[M+H]⁺ measured: 713.2973

Example 4. N-(4-Hydroxyphenyl)-N-(1H-indol-5-yl)-1-methyl-5-(6-{[(3S)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 3 using the compound of Preparation 4 in Step A.

Elemental microanalysis: (% , theoretical:measured)

%C=71.45:69.32; %H=5.86:5.22; %N=11.63:11.08

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₃H₄₂N₆O₅

[M+H]⁺ calculated: 723.3295

[M+H]⁺ measured: 723.3262

Unless otherwise mentioned, the compounds of the following Examples are synthesised in accordance with the process of Example 1 using, in Step A: (i) the appropriate acid obtained according to one of Preparations 1 to 32 and (ii) the appropriate tetrahydroisoquinoline compound obtained according to one of Preparations 1' to 9' and, in Step C: (iii) the suitable NHR_3R_4 amine (a non-exhaustive list is proposed in Preparations 1'' to 42''). The compounds thereby obtained are optionally subjected to a step of conversion into salt form in the presence of HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the hydrochloride of the expected compound is obtained.

Example 5. 5-(5-Chloro-2-[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-indol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=64.54:64.9; %H=5.67:5.49; %N=10.5:10.4; %Cl=13.29:12.52; %Cl=8.86:7.39

Example 6. 5-(5-Chloro-2-[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-ethyl-*N*-(4-hydroxyphenyl)-*N*-(1-methyl-1*H*-indol-5-yl)-1*H*-pyrrole-3-carboxamide

High-resolution mass spectrometry (ESI+):

Empirical formula: $\text{C}_{44}\text{H}_{45}\text{ClN}_6\text{O}_3$

$[\text{M}+\text{H}]^+$ calculated: 741.3320

$[\text{M}+\text{H}]^+$ measured: 741.3326

Example 7. 5-(5-Chloro-2-[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-cyclopropyl-*N*-(4-hydroxyphenyl)-*N*-(1-methyl-1*H*-indol-5-yl)-1*H*-pyrrole-3-carboxamide

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₅H₄₅ClN₆O₃

[M+H]⁺ calculated: 753.3320

[M+H]⁺ measured: 753.3306

- 5 **Example 8.** 5-(5-Chloro-2-{[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*-(1-methyl-1*H*-indol-5-yl)-1-(propan-2-yl)-1*H*-pyrrole-3-carboxamide

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₅H₄₇ClN₆O₃

10 [M+H]⁺ calculated: 755.3476

[M+H]⁺ measured: 755.3466

Example 9. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-indol-5-yl)-5-(6-{[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

- 15 **Elemental microanalysis: (% , theoretical:measured)**

%C=65.26:65.8; %H=5.73:5.47; %N=10.38:10.48; %Cl=8.76:8.46; %Cl=8.76:8.02

Example 10. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

- 20 **Elemental microanalysis: (% , theoretical:measured)**

%C=69.11:68.56; %H=5.8:5.31; %N=8.06:8.13; %Cl=5.1:4.68

Example 11. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(3-hydroxypropyl)-2-methyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Step A: 1-[3-(Benzyloxy)propyl]-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 10 and the compound of Preparation 3' in Step A, and the compound of Preparation 2" in Step C.

Step B: 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(3-hydroxypropyl)-2-methyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

The compound of Step A is subjected to a deprotection reaction in accordance with a protocol analogous to that described in Step B of Example 23.

Elemental microanalysis: (% , theoretical:measured)

%C=68.24:67.96; %H=6.5.79; %N=7.58:7.61; %Cl=4.8:4.75

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂H₄₃FN₄O₅

[M+H]⁺ calculated: 703.3296

[M+H]⁺ measured: 703.33294

Example 12. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-indazol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=67.33:67.39; %H=5.65:5.18; %N=11.22:11.52; %Cl=4.73:3.82

Example 13. *N*-(3-Fluoro-4-methylphenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

5 %C=66.97:66.72; %H=5.62:5.21; %N=7.44:7.59; %Cl=4.71:4.54

Example 14. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-indazol-5-yl)-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

10 %C=66.62:66.59; %H=5.59:4.67; %N=10.84:10.85; %Cl=4.57:4.24

Example 15. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-
ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-
1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

15 %C=68.28:67.07; %H=5.73:5.09; %N=7.77:7.75; %Cl=4.92:5.71

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁H₄₀N₄O₆

[M+H]⁺ calculated: 685.3026

[M+H]⁺ measured: 685.3033

20 **Example 16.** *N*-(3-Fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-
(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-
5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=66.62:66.11; %H=5.45:5.2; %N=7.58:7.89; %Cl=4.8:5.59

Example 17. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

5 %C=67.51:66.91; %H=5.66:5.05; %N=7.87:7.88; %Cl=4.98:5.75

Example 18. 1-(2-Hydroxyethyl)-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{[(3*S*)-3-[2-(morpholin-4-yl)ethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

10 **Step A:** 1-[2-(Benzyloxy)ethyl]-*N*-[4-(benzyloxy)phenyl]-2-methyl-5-(6-{[(3*S*)-3-[2-(morpholin-4-yl)ethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 9 and (3*S*)-3-[2-(morpholin-4-yl)ethyl]-1,2,3,4-tetrahydroisoquinoline (see Preparation 5') in Step A, and 4-(benzyloxy)-*N*-phenylaniline (see Preparation 8'') in Step C.

15

Step B: 1-(2-Hydroxyethyl)-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{[(3*S*)-3-[2-(morpholin-4-yl)ethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

The compound of Step A is subjected to a deprotection reaction in accordance with a protocol analogous to that described in Step B of Example 23.

20

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₈H₄₀N₆O₅

[M+H]⁺ calculated: 729.3283

[M+H]⁺ measured: 729.3282

25 **Example 19.** *N*-(4-Hydroxyphenyl)-5-(5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=69.63:69.45; %H=6.13:5.94; %N=7.92:7.79; %Cl=5.01:4.58

Example 20. *N*-(4-Hydroxyphenyl)-5-(5-methoxy-2-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=69.39:69.66; %H=5.66:5.46; %N=8.99:8.92; %Cl=5.69:5.29

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₆H₃₅N₄O₄

[M+H]⁺ calculated: 587.2653

[M+H]⁺ measured: 587.2649

Example 21. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(7-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-2,3-dihydro-1,4-benzodioxin-6-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=64.99:64.67; %H=5.86:5.67; %N=11.37:11.27; %Cl=4.8:4.71

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₃N₆O₆

[M+H]⁺ calculated: 703.3236

[M+H]⁺ measured: 703.3239

Example 22. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(7-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-2,3-dihydro-1,4-benzodioxin-6-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=68.61:67.97; %H=5.89:5.59; %N=7.62:7.55; %Cl=4.82:4.27

Example 23. 1-(2-Hydroxyethyl)-N-(4-hydroxyphenyl)-2-methyl-5-(6- $\{[(3R)$ -3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

Step A: 1-[2-(Benzyloxy)ethyl]-N-(4- $\{[tert$ -butyl(dimethyl)silyl]oxy}phenyl)-2-methyl-5-(6- $\{[(3R)$ -3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 9 and the compound of Preparation 1" in Step C.

Step B: N-(4- $\{[tert$ -Butyl(dimethyl)silyl]oxy}phenyl)-1-(2-hydroxyethyl)-2-methyl-5-(6- $\{[(3R)$ -3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

To a solution of 6.86 g (8.19 mmol) of the compound of Step A in 70 mL of anhydrous methanol there are added 1.37 g of Pd/C 10%. The batch is degassed for 0.5 hours and then stirred at ambient temperature under dihydrogen pressure (1.5 bar) for 12 hours. The reaction mixture is then filtered and then concentrated to dryness. The expected product is obtained in the form of a solid.

¹H NMR: δ (500 MHz; dmso-d₆; 300K): 7.7-7.4 (s, 1H, H pyrazole); 7.1-6.8 (s, 1H, H pyrazole); 7.3-6.9 (m, 4H, aromatic Hs, H tetrahydroisoquinoline); 7.0-6.7 (m, 2H, aromatic Hs); 6.9-6.4 (m, 2H, aromatic Hs); 6.8-6.4 (m, 2H, aromatic Hs); 6.1 (m, 2H, OCH₂O); 5.2, 5.0, 4.7 (4s, H, H-pyrrole (presence of conformational isomers); 5.15 (d, 1H, aliphatic H, H tetrahydroisoquinoline); 4.9 (m, 1H, aliphatic H, H tetrahydroisoquinoline); 4.9-4.8 (m, 1H, CH₂OH); 4.7 (m, 1H, aliphatic H, H tetrahydroisoquinoline); 3.9 (d, 1H, aliphatic H, H tetrahydroisoquinoline); 3.85 (m, 1H, aliphatic H, H tetrahydroisoquinoline); 3.7 (m, 2H, aliphatic Hs, CH₂CH₂OH); 3.75 (2s, 3H,); 3.5-3.2 (m, 2H, aliphatic Hs, CH₂CH₂OH); 3.0-2.4 (m, 2H, aliphatic H, H tetrahydroisoquinoline); 2.4-2.3 (4s, 3H, CH₃-pyrrole); 1.5, 0.95, 0.75 (4 d, 3H, CH₃-THIQ); 0.85 (broad s, 9H, Si(CH₃)₂(CH(CH₃)₂); 0.15 (m, 6H, Si(CH₃)₂(CH(CH₃)₂))

IR: v: -OH: 3346 cm⁻¹ carboxylic acid; v: >C=O: 1621 cm⁻¹

Step C: 1-(2-Hydroxyethyl)-N-(4-hydroxyphenyl)-2-methyl-5-(6-{{(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

- 5 The phenol function of the compound of Step B is deprotected following the process of Step D of Example 1.

Elemental microanalysis: (% , theoretical:measured)

%C=68.23:68.12; %H=5.57:5.29; %N=11.05:10.79

High-resolution mass spectrometry (ESI+):

10 Empirical formula: C₃₆H₃₆N₅O₆

[M+H]⁺ calculated: 634.2662

[M+H]⁺ measured: 634.2660

Example 24. N-(4-Hydroxyphenyl)-5-(5-methoxy-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide hydrochloride

15

Elemental microanalysis: (% , theoretical:measured)

%C=65.86:64.47; %H=6.09:5.88; %N=11.82:11.45; %Cl=4.98:6.7

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₉H₄₂N₆O₅

20 [M+H]⁺ calculated: 675.3289

[M+H]⁺ measured: 675.3287

Example 25. 5-(5-Chloro-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=63.77:62.83; %H=5.63:5.83; %N=11.74:11.29; %Cl=4.95:5.42

Example 26. *N*-(4-Hydroxyphenyl)-2-methyl-1-[2-(methylamino)ethyl]-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with Steps A, B and C of the process of Example 30 replacing the sodium azide used in Step B by methylamine. After purification over silica gel (CH₂Cl₂/MeOH/NH₃ gradient), the compound obtained, 0.3 g (0.46 mmol), is dissolved in 5 mL of anhydrous methanol and there is added, dropwise, 0.464 mL (0.47 mmol) of 1M HCl solution in ether. The batch is stirred for 0.5 hours at ambient temperature. The precipitate thereby obtained is filtered off and dried and then dissolved in a mixture of CH₃CN/H₂O before being lyophilised at low temperature. The expected product is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

%C=65.05:64.64; %H=5.75:5.43; %N=12.3:12.3; %Cl=5.19:5.39

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₇H₃₈N₆O₅

[M+H]⁺ calculated: 647.2903

[M+H]⁺ measured: 647.2922

Example 27. 1-[2-(Dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the process of Example 26, replacing the methylamine in Step B by dimethylamine.

Elemental microanalysis: (% , theoretical:measured)

%C=65.46:65.07; %H=5.93:5.87; %N=12.05:12.06; %Cl=5.08:5.55

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₈H₄₀N₆O₅

[M+H]⁺ calculated: 661.3060

[M+H]⁺ measured: 661.3045

5 **Example 28.** 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% theoretical:measured)

%C=66.99:66.88; %H=5.14:5.28; %N=8.93:8.87; %Cl=5.65:4.98

10 ***High-resolution mass spectrometry (ESI+):***

Empirical formula: C₃₅H₃₂ClN₄O₃

[M+H]⁺ calculated: 591.2157

[M+H]⁺ measured: 591.2178

15 **Example 29.** 5-(5-Chloro-2-{[(3*S*)-3-{[2-(morpholin-4-yl)ethoxy]methyl}-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Step A: Methyl 5-(5-chloro-2-{[(3*S*)-3-(hydroxymethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxylate

20 To a solution of 4.9 g of the compound of Preparation 1 in a mixture of 40 mL of dimethylformamide and 40 mL of tetrahydrofuran there are added 2.73 g (1.1 equivalents) of (3*S*)-3-hydroxymethyl-1,2,3,4-tetrahydroisoquinoline, 7.95 mL of diisopropylethylamine and 9.84 g (1.7 equivalents) of HATU. After stirring for 2 hours at ambient temperature, the reaction mixture is dried, taken up in ethyl acetate and then washed with 10 % aqueous citric acid solution and water. The combined aqueous phases are extracted
25 with ethyl acetate. The organic phases thereby obtained are combined, dried over Na₂SO₄, filtered and concentrated under reduced pressure. The crude product obtained is purified by chromatography over silica gel using dichloromethane and ethanol as eluants to yield the title compound.

¹H NMR: δ (500 MHz; dms_o-d₆; 300K): 7.6-7.4 (m, 3H, Cl-Ph); 7.2-6.9 (m, 4H, Ar(THIQ)); 6.5-6.15 (broad 4s, 1H, pyrrole); 4.9-3.8 (6 d, 2H, NCH₂ THIQ); 4.85-3.6 (m, 1H, NCH THIQ); 4.2-4.0 (m, 2H, OCH₂ ester), 3.45-3.2 (3s, 3H, N-CH₃); 3.35-3.0 (3m, 2H, HOCH₂); 3.0-2.0 (m, 2H, THIQ); 2.5-2.1 (m, 3H, CH₃ pyrrole); 1.25-1.1 (m, 3H, CH₃ ester)

IR: ν -OH: 3388 cm⁻¹, ν >C=O: 1693 cm⁻¹ (conjugated ester), ν >C=O: 1620 cm⁻¹ (amide)

Step B: Methyl 5-(5-chloro-2-[[[(3S)-3-{[2-(morpholin-4-yl)ethoxy]methyl}-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-1,2-dimethyl-1H-pyrrole-3-carboxylate

A solution of 1.7 g (3.2 mmol) of the compound obtained in the above Step in 20 mL of dimethylformamide is added, dropwise at 0°C, to a suspension of 0.280 g of NaH 60 % in oil (2.2 equivalents) in 10 mL of dimethylformamide. After stirring for 5 minutes at ambient temperature, a suspension of 0.68 g of 4-(2-bromoethyl)morpholine hydrobromide (1.1 equivalents) is added dropwise. The reaction mixture is stirred at ambient temperature for 45 minutes. There are then added, in two steps over 20 hours, 2.2 equivalents of 4-(2-bromoethyl)morpholine hydrobromide, and then 3 equivalents of NaH 60 % in oil. The reaction mixture is then poured into a mixture of 10 % aqueous ammonium chloride and ethyl acetate. The resulting organic phase is successively washed with water, and then with saturated aqueous LiCl solution and brine. It is then dried over Na₂SO₄, filtered and concentrated under reduced pressure. The oil obtained is purified by chromatography over silica gel using dichloromethane and ethanol as eluants to provide the expected product.

¹H NMR: δ (500 MHz; dms_o-d₆; 300K): 7.6-7.3 (m, 3H, Cl-Ph); 7.2-6.85 (m, 4H, Ar(THIQ)); 6.5-6.15 (broad s, 1H, pyrrole); 5.25-3.8 (m, 2H, NCH₂ THIQ); 5.05-3.75 (m, 1H, NCH THIQ); 4.2-4.0 (m, 2H, OCH₂ ester), 3.5-3.25 (m, 3H, N-CH₃); 3.6-2.75 (m, 8H, OCH₂ morpholinoethoxymethyl); 2.95-2.05 (m, 2H, THIQ); 2.55-2.15 (m, 6H, NCH₂ morpholinoethoxymethyl); 2.55-2.05 (m, 3H, CH₃ pyrrole), 1.25-1.1 (m, 3H, CH₃ ester)

IR: ν >C=O: 1694 cm⁻¹ (conjugated ester), ν >C=O: 1629 cm⁻¹ (amide)

Step C: 5-(5-Chloro-2- $\{[(3S)$ -3- $\{[2$ -(morpholin-4-yl)ethoxy]methyl}-3,4-dihydro-isoquinolin-2(1H)-yl]carbonyl}phenyl)-1,2-dimethyl-1H-pyrrole-3-carboxylic acid

To a solution of 1.46 g of the compound of the above Step in 5 mL of dioxane there are added 5 mL of 1M aqueous LiOH solution. The batch is heated in a microwave apparatus (100 W) at 100°C for 2 hours. The reaction mixture is poured into water and then extracted with ethyl ether. The ethereal phase is extracted again with 10 mL of water. The aqueous phases are acidified to pH 5-6 by adding saturated aqueous ammonium chloride solution and then extracted twice with dichloromethane. The dichloromethane phase is dried over Na₂SO₄, filtered and concentrated to dryness. The title product is obtained in the form of a meringue.

¹H NMR: δ (500 MHz; dmso-d₆; 300K): 11.4 (broad s, 1H, CO₂H), 7.6-7.3 (m, 3H, Cl-Ph); 7.2-6.8 (m, 4H, Ar(THIQ)); 6.5-6.2 (broad 4s, 1H, pyrrole); 5.25-3.75 (m, 2H, NCH₂ THIQ); 5.05-3.7 (3m, 1H, NCH THIQ); 3.5-3.2 (3s, 3H, N-CH₃); 3.6-2.7 (m, 8H, OCH₂ morpholinoethoxymethyl); 2.5-2.2 (m, 6H, NCH₂ morpholinoethoxymethyl); 3.0-2.0 (m, 2H, THIQ), 2.5-2.0 (3s, 3H, CH₃ pyrrole)

IR: ν -OH: 3300-2200 cm⁻¹, ν >C=O: 1697-1662 cm⁻¹ (double band, carboxylic acid), ν >C=O: 1628 cm⁻¹ (amide)

Step D: N-(4- $\{[tert$ -Butyl(dimethyl)silyl]oxy}phenyl)-5-(5-chloro-2- $\{[(3S)$ -3- $\{[2$ -(morpholin-4-yl)ethoxy]methyl}-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-1,2-dimethyl-N-phenyl-1H-pyrrole-3-carboxamide

The acid obtained in Step C (1.48 g) is suspended in 15 mL of 1,2-dichloroethane. 1.1 equivalents of 1-chloro-N,N,2-trimethylpropenylamine are added thereto. After stirring for 1 hour at ambient temperature, there are added 15 mL of toluene and 1.05 equivalents of the compound of Preparation 2". The reaction mixture is heated for 14 hours at 110°C and then dried. The crude product thereby obtained is purified by chromatography over silica gel using dichloromethane and ethanol as eluants to yield the expected product.

¹H NMR: δ (500 MHz; dmso-d₆; 300K): 7.55-7.25 (m, 3H, Cl-Ph); 7.25-6.6 (m, 9H, Ar(THIQ)+phenyl); 6.8-6.5 (m, 2H, phenoxy); 7.0-6.6 (m, 2H, phenoxy); 5.7-5.05 (broad 4s, 1H, pyrrole); 5.2-3.6 (8d, 2H, THIQ); 5.05-3.6 (4m, 1H, NCH THIQ), 3.6-2.9 (m, 8H,

aliphatic morpholinoethoxymethyl); 3.4-3.2 (broad 3s, 3H, N-CH₃); 3.0-2.1 (m, 2H, THIQ), 2.35 (m, 2H, NCH₂ morpholinoethoxymethyl); 2.4-2.2 (m, 4H, NCH₂ morpholine); 2.4-2.15 (broad 3s, 3H, CH₃ pyrrole); 0.8 (broad 2s, 9H, SiC(CH₃)₃); 0.1 (4s, 6 H, SiCH₃)
IR: ν >C=O: 1635-1595 cm⁻¹ (double band), ν Si-O: 1117 cm⁻¹, ν Si-C: 837 cm⁻¹

5 **Step E:** 5-(5-Chloro-2- $\{[(3S)-3-\{2-(morpholin-4-yl)ethoxy\}methyl]-3,4-dihydroisoquinolin-2(1H)-yl\}carbonyl\}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-phenyl-1H-pyrrole-3-carboxamide hydrochloride$

To a solution of 0.7 g of the compound of Step D in 5 mL of methanol there is added 0.92 mL of a 1M solution of potassium hydroxide in methanol. After stirring for 1 hour
10 10 minutes at ambient temperature, saturated aqueous sodium bicarbonate solution is added. The product which precipitates is extracted with ethyl acetate and then washed with water and brine. The resulting aqueous phases are extracted again with ethyl acetate. The organic phases thereby obtained are dried over Na₂SO₄, filtered and concentrated under reduced pressure. The crude product obtained is purified by chromatography over silica gel
15 using dichloromethane and ammonia-in-ethanol as eluants to provide 0.536 g of the title product, in the form of the base. The latter is dissolved in acetonitrile and converted into salt form using 1M aqueous HCl solution. After a lyophilisation step, the expected product is obtained in the form of a solid.

Elemental microanalysis: (% , measured(theoretical))

20 %C=66.4(66.75);%H=5.98(5.87);%N=7.38(7.41);%Cl=9.42(9.38);%Cl⁻=4.57(4.69)

Example 30. 1-(2-Aminoethyl)-N-(4-hydroxyphenyl)-2-methyl-5-(6- $\{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl\}carbonyl]-1,3-benzodioxol-5-yl\}-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide hydrochloride$

25 **Step A:** 2- $\{3-[(4-\{tert-Butyl(dimethyl)silyl\}oxy\}phenyl)(1-methyl-1H-pyrazol-4-yl)carbonyl]-2-methyl-5-(6-\{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl\}carbonyl]-1,3-benzodioxol-5-yl)-1H-pyrrol-1-yl\}ethyl methanesulphonate$

A solution of 4.65 g of the compound obtained in Step B of Example 23 (6.22 mmol) in 100 mL of anhydrous THF is placed at 0°C. There are successively added thereto 3.5 mL

(12.44 mmol) of triethylamine and then, dropwise, 0.722 mL of methanesulphonic chloride (9.33 mmol) dissolved in 20 mL of THF. The batch is then stirred at ambient temperature for 2 hours. The reaction mixture is hydrolysed by addition of saturated aqueous NaHCO₃ solution and then extracted twice with ethyl acetate. The organic phases are combined,
 5 dried over MgSO₄ and concentrated to dryness. The expected compound is obtained in the form of a glassy solid.

¹H NMR: δ (500 MHz; dmso-d₆; 300K): 7.7-7.45 (s, 1H, H pyrazole); 7.1-6.9 (s, 1H, H pyrazole); 7.2-6.4 (m, 8H, aromatic Hs); 6.95-6.65 (m, 2H, aromatic Hs); 6.1 (m, 2H, OCH₂O); 5.2, 4.6 (4s, H, H-pyrrole (presence of conformational isomers); 4.9, 4.6, 3.9, 3.8
 10 (m, 1H), 5.05-3.75 (m, 1H, aliphatic H, H tetrahydroisoquinoline); 4.3-4.05 (m, 2H, aliphatic Hs, CH₂CH₂OSO₂CH₃); 4.2-3.95 (m, 2H, aliphatic Hs, CH₂CH₂OSO₂CH₃); 3.75-2.7 (2s, 3H, CH₃-pyrazole); 3.0 (several s, 3H, CH₂OSO₂CH₃); 3.05-2.5 (several m, 2H, aliphatic Hs, H tetrahydroisoquinoline); 2.45-2.3 (several s, 3H, CH₃-pyrrole); 1.05, 0.75 (several d, 3H, CH₃-tetraisoquinoline); 0.9 (several s, 9H, Si(CH₃)₂(CH(CH₃)₂); 0.1 (m,
 15 6H, Si(CH₃)₂(CH(CH₃)₂))

IR: ν: >C=O: 1626 cm⁻¹, ν: -SO₂: 1349 and 1172 cm⁻¹

Step B: *1-(2-Azidoethyl)-N-(4-{{tert-butyl(dimethyl)silyl}oxy}phenyl)-2-methyl-5-(6-
 {{{(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}-1,3-benzodioxol-5-yl)-N-(1-
 methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide*

To a solution of 2 g (2.42 mmol) of compound of Step A in 20 mL of anhydrous DMF there is added 0.472 g (7.26 mmol) of sodium azide. The batch is stirred at 65°C for 4 hours 30 minutes. The reaction mixture is poured into saturated aqueous NaHCO₃ solution and then extracted twice with ethyl acetate. The organic phases are combined and washed with saturated aqueous LiCl solution, dried over MgSO₄ and concentrated to
 25 dryness. After purification over silica gel using dichloromethane and ammonia-in-methanol as eluants, the expected product is obtained in the form of a foam.

¹H NMR: δ (500 MHz; dmso-d₆; 300K): 7.65-7.45 (several s, 1H, H pyrazole); 7.1-6.9 (several s, 1H, H pyrazole); 7.3-6.4 (several m, 6H, aromatic Hs); 7.1-6.9 (several s, 1H, aromatic Hs); 6.8, 6.5 (2m, 2H, aromatic Hs); 6.1 (several s, 2H, OCH₂O); 5.25- 4.65

(several s, 1H, H-pyrrole (presence of conformational isomers); 4.9, 4.6, 3.8 (several m, 1H); 5.05-3.7 (several m, 4H, aliphatic Hs, H-THIQ + $\text{CH}_2\text{CH}_2\text{N}_3$); 3.7 (several s, 3H, H CH_3 -pyrazole); 3.5-3.25 (m, 2H, $\text{CH}_2\text{CH}_2\text{N}_3$); 3.1-2.4 (several m, 3H, CH_3 -pyrrole); 2.45-2.3 (several s, 3H, CH_3 -pyrrole); 1.0-0.75 (several d, 3H, CH_3 -THIQ); 0.9 (several s, 9H, $\text{Si}(\text{CH}_3)_2(\text{CH}(\text{CH}_3)_2)$); 0.1 (several s, 6H, $\text{Si}(\text{CH}_3)_2(\text{CH}(\text{CH}_3)_2)$)

IR: ν :-N=N=N: 2100 cm^{-1} , ν :>C=O: 1630 cm^{-1} , ν :-Si-O-: 1035 cm^{-1}

Step C: 1-(2-Azidoethyl)-N-(4-hydroxyphenyl)-2-methyl-5-(6-((3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl)carbonyl)-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

To a solution of 1.12 g of the compound obtained in Step B (14.49 mmol) in 5 mL of methanol there are added, dropwise, 7.24 mL of 1M methanolic potassium hydroxide solution (72.45 mmol). The batch is stirred at ambient temperature for 3 hours. The reaction mixture is then concentrated to dryness, taken up in dichloromethane, hydrolysed with saturated aqueous NaHCO_3 solution and then extracted twice with dichloromethane. The organic phases are then combined, washed with water, dried over MgSO_4 and concentrated to dryness. The expected product is obtained in the form of a foam and used directly in the next Step.

$^1\text{H NMR}$: δ (500 MHz; dmsO-d_6 ; 300K): 9.60((s, 1H, $\text{CH}_2\text{CH}_2\text{OH}$); 7.65-7.45 (several s, 1H, H pyrazole); 7.1-6.9 (several s, 1H, H pyrazole); 7.3-6.4 (several m, 6H, aromatic Hs); 7.1-6.9 (several s, 1H, aromatic Hs); 6.8, 6.5 (2m, 2H, aromatic Hs); 6.15 (several s, 2H, OCH_2O); 5.35- 4.8 (several s, 1H, H-pyrrole (presence of conformational isomers); 4.9, 4.6, 3.8 (several m, 1H, aliphatic H, H tetrahydroisoquinoline); 3.7 (several s, 3H, H CH_3 -pyrazole); 3.5-3.25 (m, 2H, $\text{CH}_2\text{CH}_2\text{N}_3$); 3.1-2.4 (several m, 3H, CH_3 -pyrrole); 2.45-2.3 (several s, 3H, H THIQ); 2.45-2.3 (several s, 3H, CH_3 -pyrrole); 1.0-0.75 (several d, 3H, CH_3 -THIQ)

IR: ν :-OH: 3171 cm^{-1} , ν :-N=N=N: 2100 cm^{-1} , ν :>C=O: 1617 cm^{-1}

Step D: 1-(2-Aminoethyl)-N-(4-hydroxyphenyl)-2-methyl-5-(6-([(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide hydrochloride

To a solution of 1.27 g of the compound obtained in the above Step (1.93 mmol) in 15 mL of anhydrous ethanol there is added 0.154 g of Pd/C 10 %. The batch is degassed for 0.5 hours. It is then stirred for 12 hours at ambient temperature under hydrogen pressure (1.5 bar). The reaction mixture is then filtered and then concentrated to dryness. After purification by chromatography over silica gel (CH₂Cl₂/MeOH/NH₃ gradient), an oily residue is obtained. The residue is dissolved in 10 mL of anhydrous ethanol and then converted into salt form by adding two molar equivalents of a 1N solution of HCl in ethanol. The product is then dried before being dissolved in a minimum of a mixture of water and acetonitrile. After a lyophilisation step at low temperature, the expected product is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

%C=64.62:63.84; %H=5.57:5.55; %N=12.56:12.36; %Cl=5.3:5.56

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₆H₃₆N₆O₅

[M+H]⁺ calculated: 633.2820

[M+H]⁺ measured: 633.2808

Example 31. N-(4-Hydroxyphenyl)-5-(5-methoxy-2-([(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide

Elemental microanalysis: (% , theoretical:measured)

%C=71.29:70.17; %H=5.98:5.98; %N=11.88:11.49

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₅H₃₆N₅O₄

[M+H]⁺ calculated: 590.2762

[M+H]⁺ measured: 590.2778

Example 32. Phenyl (4-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1H-pyrrol-2-yl}-3-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}benzyl)-carbamate

Step A: *N*-(4-Benzoyloxyphenyl)-*N*,1,2-trimethyl-pyrrole-3-carboxamide

5 The process is analogous to that described in Step A of Example 45.

Step B: *tert*-Butyl [4-(4-{[4-(benzyloxy)phenyl](methyl)carbamoyl}-1,5-dimethyl-1H-pyrrol-2-yl)-3-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}benzyl)-carbamate

10 The compound of Preparation II (1.5 g; 2.96 mmol) and the compound of Step A (1.16 g; 3.44 mmol) are dissolved in dimethylacetamide (25 mL) and then nitrogen is bubbled through the solution for 5 minutes. Potassium acetate (0.586 g; 5.92 mmol) and bis(triphenylphosphine)palladium(II) dichloride (0.2 g; 0.295 mmol) are added to the mixture which is then heated to 100°C and, after stirring for 20 minutes, water (10 µL) is added. Stirring at 100°C under a nitrogen atmosphere is continued for 2 hours more. The
15 reaction mixture is allowed to cool to ambient temperature and is then evaporated to a volume of 15 mL. The resulting mixture is filtered over a short Celite column and then purified by preparative HPLC using water-TFA and acetonitrile as eluants. The pH of the appropriate fractions is adjusted to 7 with NaHCO₃, and then the acetonitrile is evaporated off under reduced pressure. The aqueous residue is extracted with DCM. The organic
20 phase is washed with brine, dried over Na₂SO₄ and evaporated to dryness to yield the title compound.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁N₅O₄

[M+H]⁺ calculated: 713.3705

25 [M+H]⁺ measured: 713.3709

Step C: 5-[4-(Aminomethyl)-2-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl]phenyl]-N-[4-(benzyloxy)phenyl]-N,1,2-trimethyl-1H-pyrrole-3-carboxamide hydrochloride

The compound of the above Step (1.18 g, 1.66 mmol) is dissolved/suspended in 4M HCl in dioxane (20 mL). The heterogeneous mixture is stirred for 30 minutes at ambient temperature and then evaporated to dryness to yield 1.19 g of the title compound which is used in the next Step without purification.

Step D: Phenyl (4-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1H-pyrrol-2-yl}-3-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}benzyl)carbamate

The title compound is obtained starting from the compound of the above Step in accordance with the protocol of Step D of Example 45.

Elemental microanalysis: (% , measured(theoretical))

%C=72.83(72.88);%H=6.01(5.96);%N=8.02(8.72)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₉H₃₈N₄O₅

[M+H]⁺ calculated: 643.2922

[M+H]⁺ measured: 643.2916

Example 33. 5-(5-Chloro-2-[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-N-(4-fluorophenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , measured(theoretical))

%C=65.75(65.84);%H=5.38(5.39);%N=7.62(7.68);%Cl=9.77(9.72);%Cl=4.84(4.86)

Example 34. 5-(5-Chloro-2-[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-N-(3-fluorophenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , measured(theoretical))

%C=65.61(65.84);%H=5.09(5.39);%N=7.76(7.68);%Cl=4.83(4.86)

Example 35. *N*-(4-Hydroxyphenyl)-*N*,1,2-trimethyl-5-(2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-4-{[(phenoxyacetyl)amino]methyl}phenyl)-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 32 using 2-phenoxyacetyl chloride as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=72.53(73.15);%H=5.76(6.14);%N=8.31(8.53)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₀N₄O₅

[M+H]⁺ calculated: 657.3079

[M+H]⁺ measured: 657.3061

Example 36. 5-(4-{[(Ethylcarbamoyl)amino]methyl}-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 32 using ethyl isocyanate as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=70.88(70.8);%H=6.02(6.62);%N=11.17(11.8)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₅H₃₉N₅O₄

[M+H]⁺ calculated: 594.3100

[M+H]⁺ measured: 594.3083

Example 37. 5-(4-{[(Benzylcarbamoyl)amino]methyl}-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 32 using benzyl isocyanate as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=73.21(73.26);%H=5.98(6.3);%N=10.23(10.68)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁N₅O₄

[M+H]⁺ calculated: 656.3239

[M+H]⁺ measured: 656.3256

Example 38. 5-(5-Chloro-2-{[(3*S*)-3-(hydroxymethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=70.97(71.34);%H=5.2(5.32);%N=6.96(6.93)

Example 39. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=69.81(69.64);%H=5.6(5.51);%N=11.55(11.6)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₅H₃₄N₅O₅

[M+H]⁺ calculated: 604.2554

[M+H]⁺ measured: 604.2565

Example 40. Phenyl (3-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1*H*-pyrrol-2-yl}-4-[[*(3R)*-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}benzyl)-carbamate

Step A: *N*-(4-Benzyloxyphenyl)-*N*,1,2-trimethyl-pyrrole-3-carboxamide

5 The process is analogous to that described in Step A of Example 45.

Step B: 5-[5-(Aminomethyl)-2-[[*(3R)*-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl]phenyl]-*N*-[4-(benzyloxy)phenyl]-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

10 The compound of Preparation III (1.84 g; 3.99 mmol) and the compound of Step A (1.60 g; 4.48 mmol) are dissolved in dimethylacetamide (20 mL) and then nitrogen is bubbled through the solution for 5 minutes. Potassium acetate (0.78 g; 7.48 mmol) and bis(triphenylphosphine)palladium(II) dichloride (0.28 g; 0.4 mmol) are added to the mixture which is then heated to 105°C and, after stirring for 10 minutes, water (11 µL) is added. Stirring at 105°C under a nitrogen atmosphere is continued for 6 hours more. The
15 reaction mixture is allowed to cool to ambient temperature, the resulting mixture is filtered over a short Celite column and is then purified by preparative HPLC using water-TFA and acetonitrile as eluants. The pH of the appropriate fractions is adjusted to 7 with NaHCO₃ and then the acetonitrile is evaporated off under reduced pressure. The solid precipitate is removed by filtration and then dried (5 mbar, 45°C, 16 hours) to form *tert*-butyl [3-(4-{[4-(benzyloxy)phenyl](methyl)carbamoyl]-1,5-dimethyl-1*H*-pyrrol-2-yl}-4-[[*(3R)*-3-methyl-
20 3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}benzyl]carbamate which is dissolved/suspended in 4M HCl in dioxane (35 mL). The heterogeneous mixture is stirred for 30 minutes at ambient temperature and then evaporated to dryness to yield the title compound which is used in the next Step without purification.

25 **High-resolution mass spectrometry (ESI+):**

Empirical formula: C₃₉H₄₀N₄O₃

[M+H]⁺ calculated: 613.3180

[M+H]⁺ measured: 613.3194

IR: ν : N-H+: 2854 cm^{-1} ; $>\text{C}=\text{O}$: 1621 cm^{-1} ; C-O-C: 1234, 1120, 1011 cm^{-1}

Step C: Phenyl (3-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1H-pyrrol-2-yl}-4-[[{(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}benzyl)carbamate

The title compound is obtained starting from the compound of the above Step in accordance with the process of Step D of Example 45.

Elemental microanalysis: (% , measured(theoretical))

%C=73.2(72.88); %H=5.83(5.96); %N=8.13(8.72)

High-resolution mass spectrometry (ESI+):

Empirical formula: $\text{C}_{39}\text{H}_{38}\text{N}_4\text{O}_5$

[M+H]⁺ calculated: 643.2922

[M+H]⁺ measured: 643.2902

Example 41. N-(3-Fluorophenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-[[{(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl]-1H-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=71.44(71.95); %H=4.95(5.22); %N=6.8(6.8)

High-resolution mass spectrometry (ESI+):

Empirical formula: $\text{C}_{37}\text{H}_{33}\text{FN}_3\text{O}_5$

[M+H]⁺ calculated: 618.2399

[M+H]⁺ measured: 618.2392

Example 42. N-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-[[{(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl)-1H-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=71.32(71.65); %H=5.17(5.4); %N=10.67(10.71)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₉H₃₆N₅O₅

[M+H]⁺ calculated: 654.2711

[M+H]⁺ measured: 654.2710

5 **Example 43.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=73.9(74.11);%H=5.16(5.55);%N=6.81(7.01)

10 ***High-resolution mass spectrometry (ESI+):***

Empirical formula: C₃₇H₃₄N₃O₅

[M+H]⁺ calculated: 600.2493

[M+H]⁺ measured: 600.2495

15 **Example 44.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]-pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , measured(theoretical))

%C=66.41(66.62);%H=5.08(5.59);%N=10.85(10.84);%Cl=4.68(4.57)

High-resolution mass spectrometry (ESI+):

20 Empirical formula: C₄₃H₄₂N₆O₆

[M+H]⁺ calculated: 739.3239

[M+H]⁺ measured: 739.3246

Example 45. Phenyl [2-(3-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1*H*-pyrrol-2-yl}-4-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-phenyl)ethyl]carbamate

Step A: N-(4-Benzoyloxyphenyl)-N,1,2-trimethyl-pyrrole-3-carboxamide

5 To a suspension of 1,2-dimethylpyrrole-3-carboxylic acid (2.085 g; 15 mmol) in 1,2-dichloroethane (40 mL) there is added 1-chloro-*N,N*,2-trimethyl-prop-1-en-1-amine (2.37 mL; 17.9 mmol), and the solution formed is stirred for 1 hour. To the resulting solution there is added, dropwise, an ice-cold solution of 4-benzyloxy-*N*-methyl-aniline (3.73 g; 15 mmol) and *N*-ethyl-*N*-isopropyl-propan-2-amine (7.75 mL; 45 mmol) in 1,2-
10 dichloroethane (40 mL). The reaction mixture is stirred at ambient temperature for 1 hour; it is then diluted with dichloromethane (250 mL) and washed with water (2 x 30 mL), dried over Na₂SO₄ and evaporated. The crude product is triturated with diethyl ether and the solid formed is filtered off to yield the title compound.

IR: ν : >C=O: 1616 cm⁻¹; amide: 1508 cm⁻¹; C-O-C: 1230, 1172, 1009 cm⁻¹

15 ***Step B: tert-Butyl {2-[3-(4-{[4-(benzyloxy)phenyl](methyl)carbamoyl]-1,5-dimethyl-1*H*-pyrrol-2-yl}-4-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)ethyl}-carbamate***

The compound of Preparation I (0.869 g; 1.67 mmol) and the compound of Step A (0.558 g; 1.67 mmol) are dissolved in dimethylacetamide (8 mL) and then nitrogen is
20 bubbled through the solution for 5 minutes. Potassium acetate (0.33 g; 3.34 mmol) and bis(triphenylphosphine)palladium(II) dichloride (0.117 g; 0.167 mmol) are added to the mixture which is then heated to 140°C and, after stirring for 10 minutes, water (80 μ L) is added. Stirring at 140°C under a nitrogen atmosphere is continued for 16 hours more. The reaction mixture is allowed to cool to ambient temperature and then evaporated. The
25 residue is partitioned between dichloromethane (100 mL) and water (20 mL). The organic phase is washed with water (20 mL), dried over Na₂SO₄ and evaporated. The residue was purified by preparative HPLC using water-TFA and acetonitrile as eluants. The pH of the appropriate fractions is adjusted to 12 using aqueous NaOH solution and then the acetonitrile is evaporated off under reduced pressure. The aqueous residue is extracted with

dichloromethane (2 x 100 mL). The organic phase is dried over Na₂SO₄ and evaporated to dryness to yield the title compound.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₅H₅₀N₄O₅

5 [M+H]⁺ calculated: 727.3861

[M+H]⁺ measured: 727.3852

IR: ν: >C=O: 1705, 1618 cm⁻¹; amide: 1509 cm⁻¹; C-O-C: 1242, 1166, 1012 cm⁻¹

Step C: 5-[5-(2-Aminoethyl)-2-[[[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl]phenyl]-N-[4-(benzyloxy)phenyl]-N,1,2-trimethyl-1H-pyrrole-3-carboxamide hydrochloride

10

The compound of Step B (0.35 g; 0.48 mmol) was dissolved/suspended in 4M HCl in dioxane (3 mL). The heterogeneous mixture is stirred for 30 minutes at ambient temperature and then evaporated to dryness to yield the title compound which is used in next Step without being otherwise purified.

15 ***High-resolution mass spectrometry (ESI+):***

Empirical formula: C₄₀H₄₂N₄O₃

[M+H]⁺ calculated: 627.3337

[M+H]⁺ measured: 627.3309

IR: ν: C-H: 2931 cm⁻¹; >C=O: 1608 cm⁻¹; amide: 1508 cm⁻¹; C-O-C: 1233, 1012 cm⁻¹

20 ***Step D: Phenyl 2-(3-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-dimethyl-1H-pyrrol-2-yl}-4-[[[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl]ethyl)-carbamate***

The compound of Step C (0.10 g; 0.15 mmol) is dissolved in dichloromethane. Phenyl chloroformate (0.027 g; 0.17 mmol) and diisopropylethylamine (0.097 g, 0.75 mmol) are added thereto. The reaction mixture is stirred at ambient temperature for 30 minutes. After
25 dilution with dichloromethane (100 mL), the organic phase is washed with water (20 mL),

evaporated and concentrated. The residue is then dissolved in ethanol and a Pd/C catalyst is added (10 mg). The reaction mixture is hydrogenated at atmospheric pressure at ambient temperature. When the reaction is complete, the catalyst is removed by filtration, the filtrate is concentrated and the crude product is purified by chromatography over silica gel using dichloromethane and methanol as eluants, to yield the title product.

Elemental microanalysis: (% , measured(theoretical))

%C=72.36(73.15);%H=6.15(6.14);%N=8.14(8.53)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₀N₄O₅

[M+H]⁺ calculated: 657.3077

[M+H]⁺ measured: 657.3062

Example 46. N-(4-Hydroxyphenyl)-N,1,2-trimethyl-5-(2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-5-{2-[(phenoxyacetyl)amino]ethyl}phenyl)-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 45 using 2-phenoxyacetyl chloride as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=72.74(73.41);%H=6.38(6.31);%N=7.65(8.35)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁H₄₂N₄O₅

[M+H]⁺ calculated: 671.3235

[M+H]⁺ measured: 671.3226

Example 47. N-(4-Hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-5-(6-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , measured(theoretical))

%C=64.25(64.59);%H=5.4(5.7);%N=11.41(11.59);%Cl=4.93(4.89)

Example 48. *N*-(4-Hydroxyphenyl)-*N*-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-5-(6-
5 {[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-
pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=68.07(68.45);%H=5(5.27);%N=10.74(11.09)

Example 49. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-
pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-
10 dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-
carboxamide dihydrochloride

Step A: *N*-(4-{[*tert*-Butyl(dimethyl)silyl]oxy}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-
pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-
2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

15 The title compound is obtained in accordance with the process of Example 1 using the acid
of Preparation 11 and (3*S*)-3-(4-morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline (see
Preparation 3') in Step A, and the compound of Preparation 11" in Step C.

Step B: *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-
b]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-
20 yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

To a solution of 0.21 g (0.2 mmol) of the compound of Step A in 3 mL of acetic acid there
are added 85 mg of sodium cyanoborohydride (5 equivalents). The reaction mixture is
stirred for 3 hours at ambient temperature and then overnight at 50°C. There are then added
2.6 equivalents of sodium cyanoborohydride and the reaction mixture is heated at 50°C for
25 3 hours. The operation is repeated for a second time (addition of 2.6 equivalents of sodium
cyanoborohydride and then heating at 50°C for 3 hours). After coevaporation of the acetic
acid in the presence of toluene, the residue is taken up in 3 mL of methanol. The pH of the
solution is adjusted to 12 using 1M methanolic potassium hydroxide solution. After stirring

overnight at ambient temperature, the reaction mixture is poured into saturated aqueous sodium bicarbonate solution and extracted with dichloromethane. The resulting organic phase is washed with brine, dried over Na₂SO₄, filtered and concentrated under reduced pressure. The product obtained is purified by chromatography over silica gel (dichloromethane/ethanol/ammonia 94/6/0.6) and then over a Lichroprep RP18 column (water/acetonitrile/trifluoroacetic acid). After evaporation of the acetonitrile, the product is neutralised with sodium bicarbonate. It is then extracted with ethyl acetate. The organic phase is dried over Na₂SO₄, filtered and concentrated under reduced pressure. The residue obtained is dissolved in acetonitrile and converted into salt form with 1M aqueous HCl solution. After lyophilisation, the title product is obtained in the form of a solid.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₃H₄₄N₆O₆

[M+H]⁺ calculated: 741.3395

[M+H]⁺ measured: 741.3400

Example 50. *N*-(4-Hydroxyphenyl)-*N*-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₀N₆O₇

[M+H]⁺ calculated: 717.3031

[M+H]⁺ measured: 717.3031

Example 51. 5-(5-{[(Benzylcarbamoyl)amino]methyl}-2-{[(3*R*)-3-methyl-3,4-
dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-
1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 40 using benzyl isocyanate as acylating agent in Step C.

Elemental microanalysis: (% , measured(theoretical))

%C=73.39(73.26);%H=6.16(6.3);%N=10.08(10.68)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁N₅O₄

5 [M+H]⁺ calculated: 656.3239

[M+H]⁺ measured: 656.3226

Example 52. 5-(5-{[(Ethylcarbamoyl)amino]methyl}-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

10 The title compound is obtained in accordance with the process of Example 40 using ethyl isocyanate as acylating agent in Step C.

Elemental microanalysis: (% , measured(theoretical))

%C=71.4(70.8);%H=6.41(6.62);%N=11.24(11.8)

High-resolution mass spectrometry (ESI+):

15 Empirical formula: C₃₅H₃₉N₅O₄

[M+H]⁺ calculated: 594.3082

[M+H]⁺ measured: 594.3069

Example 53. *N*-(4-Hydroxyphenyl)-*N*,1,2-trimethyl-5-(2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-{[(phenoxyacetyl)amino]methyl}phenyl)-1*H*-pyrrole-3-carboxamide

20 The title compound is obtained in accordance with the process of Example 40 using 2-phenoxyacetyl chloride as acylating agent in Step C.

Elemental microanalysis: (% , measured(theoretical))

%C=72.32(73.15);%H=6.21(6.14);%N=7.84(8.53)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₀N₄O₅

[M+H]⁺ calculated: 657.3079

[M+H]⁺ measured: 657.3105

5 **Example 54.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-{[(phenoxyacetyl)amino]methyl}phenyl)-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=73.87(73.04);%H=5.47(5.74);%N=10.26(10.87)

10 **Example 55.** 5-(5-[2-({[2-(4-Fluorophenyl)ethyl]sulphonyl}amino)ethyl]-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 45 using 2-(4-fluorophenyl)ethanesulphonyl chloride as acylating agent in Step D.

15 *Elemental microanalysis: (% , measured(theoretical))*

%C=67.42(68.12);%H=5.76(6);%N=7.27(7.75);S=3.68(4.44)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁H₄₃FN₄O₅S

[M+H]⁺ calculated: 723.3018

20 [M+H]⁺ measured: 723.3011

Example 56. 5-(5-{2-[(Benzylcarbamoyl)amino]ethyl}-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

25 The title compound is obtained in accordance with the process of Example 45 using benzyl isocyanate as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=71.14(73.52);%H=6.47(6.47);%N=9.42(10.46)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁H₄₃N₅O₄

5 [M+H]⁺ calculated: 670.3395

[M+H]⁺ measured: 670.3390

Example 57. N-(4-Hydroxyphenyl)-N,1,2-trimethyl-5-(2-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-5-{2-[(phenylacetyl)amino]ethyl}phenyl)-1H-pyrrole-3-carboxamide

10 The title compound is obtained in accordance with the process of Example 45 using phenylacetyl chloride as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=75.46(75.21);%H=6.11(6.46);%N=8.31(8.56)

High-resolution mass spectrometry (ESI+):

15 Empirical formula: C₄₁H₄₂N₄O₄

[M+H]⁺ calculated: 655.3286

[M+H]⁺ measured: 655.3285

Example 58. N-(4-Hydroxyphenyl)-N,1,2-trimethyl-5-(2-[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-5-{2-[(phenylcarbamoyl)amino]ethyl}phenyl)-1H-pyrrole-3-carboxamide

20 The title compound is obtained in accordance with the process of Example 45 using phenyl isocyanate as acylating agent in Step D.

Elemental microanalysis: (% , measured(theoretical))

%C=71.25(73.26);%H=6.12(6.3);%N=9.61(10.68)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁N₅O₄

[M+H]⁺ calculated: 656.3239

[M+H]⁺ measured: 656.3226

5 **Example 59.** 5-(4-[(2-(4-Fluorophenyl)ethyl)sulphonyl]amino)methyl)-2-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 32 using 2-(4-fluorophenyl)ethanesulphonyl chloride as sulphonylation agent in Step D.

10 **Elemental microanalysis: (% , measured(theoretical))**

%H=5.19(5.83);%N=7.28(7.9);S=4.45(4.52);%C=66.17(67.78)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁FN₄O₅S

[M+H]⁺ calculated: 709.2866

15 [M+H]⁺ measured: 709.2866

Example 60. 5-(5-Chloro-2-[(3*S*)-3-[(2-(dimethylamino)ethoxy)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxy phenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

20 The process of Example 29 is used, on the one hand replacing the 4-(2-bromoethyl)morpholine hydrobromide used in Step B by 2-chloroethyldimethylamine hydrochloride and on the other hand adding a catalytic amount of tetrabutylammonium iodide.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁ClN₄O₄

25 [M+H]⁺ calculated: 677.2890

[M+H]⁺ measured: 677.2887

Example 61. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₃₆H₃₂N₄O₅

[M+H]⁺ calculated: 601.2445

[M+H]⁺ measured: 601.2424

Example 62. 5-(5-Fluoro-4-methoxy-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=68.99(69.18);%H=5.89(5.64);%N=11.35(11.52)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₅H₃₄FN₅O₄

15 [M+H]⁺ calculated: 608.2668

[M+H]⁺ measured: 608.2640

Example 63. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]-pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

20 *Elemental microanalysis: (% , measured(theoretical))*

%C=70.48(70.85);%H=5.67(5.32);%N=11.2(10.87)

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₈H₃₄ClN₅O₃

[M+H]⁺ calculated: 666.2242

25 [M+H]⁺ measured: 666.2235

Example 64. *N*,1,2-Trimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₃₈H₄₀N₆O₅

[M+H]⁺ calculated: 661.3133

[M+H]⁺ measured: 661.3125

Example 65. 1,2-Dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-
(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-
5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₃H₄₂N₆O₅

[M+H]⁺ calculated: 723.3289

[M+H]⁺ measured: 723.3287

Example 66. 4-Methylphenyl (4-{4-[(4-hydroxyphenyl)(methyl)carbamoyl]-1,5-
dimethyl-1*H*-pyrrol-2-yl}-3-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-
carbonyl}benzyl)carbamate

The title compound is obtained in accordance with the process of Example 32 using 4-
methylphenyl chloroformate as acylating agent in Step D.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₀N₄O₅

[M+H]⁺ calculated: 657.3079

[M+H]⁺ measured: 657.3076

Example 67. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-
2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-
pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , measured(theoretical))

%C=65.69(65.28);%H=5.38(5.77);%N=11.18(12.02);%Cl=5.61(5.07)

Example 68. 5-(5-Fluoro-4-hydroxy-2-[[*(3R)*-3-methyl-3,4-dihydroisoquinolin-2(*1H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

A 1N solution of tribromoborane (1.3 equivalents) in dichloromethane is poured rapidly, at ambient temperature, into a solution of the compound of Example 62 in dichloromethane. This operation is repeated twice in order to complete the reaction in 5 hours. The reaction mixture is poured into anhydrous ethanol at 5°C. After stirring for 10 minutes, saturated aqueous NaHCO₃ solution is added. The mixture is extracted with dichloromethane, dried over Na₂SO₄ and concentrated to dryness. The crude product obtained is purified by preparative HPLC using water, TFA and acetonitrile as eluants. The pH of the appropriate fractions is adjusted to 12 with saturated aqueous NaHCO₃ solution, and then the acetonitrile is evaporated off under reduced pressure. The aqueous residue is extracted with dichloromethane. The organic phase is dried over Na₂SO₄ and evaporated to dryness to yield the title compound.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₄H₃₂FN₅O₄

[M+H]⁺ calculated: 594.2511

[M+H]⁺ measured: 594.2517

Example 69. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-[[*(3S)*-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(*1H*)-yl]carbonyl]-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₄H₄₅N₇O₅

[M+H]⁺ calculated: 752.3555

[M+H]⁺ measured: 752.3552

Example 70. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₄₁H₄₂N₆O₅

[M+H]⁺ calculated: 699.3289

[M+H]⁺ measured: 699.3293

Example 71. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂H₄₁ClN₆O₄

[M+H]⁺ calculated: 723.3289

[M+H]⁺ measured: 723.3287

15 **Example 72.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-benzimidazol-5-yl)-1*H*-pyrrole-3-carboxamide

Elemental microanalysis: (% , measured(theoretical))

%C=68.90(69.17);%H=5.32(5.67);%N=11.40(11.52)

20 **Example 73.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₃₉N₅O₆

25 [M+H]⁺ calculated: 686.2973

[M+H]⁺ measured: 686.2971

Example 74. 5-(5-Chloro-2-[[[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₃₉H₃₈ClN₅O₄

[M+H]⁺ calculated: 676.2685

[M+H]⁺ measured: 676.2684

Example 75. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-[[[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]-1,3-benzodioxol-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=60.12:59.77; %H=4.92:4.76; %N=10.79:10.39 %Cl=4.55:5.17

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₉ H₃₇ F₃ N₆ O₆

15 [M+H]⁺ calculated: 743.2799

[M+H]⁺ measured: 742.2802

Example 76. 2-(Difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-[[[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 77.** *N*-(4-Hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-[[[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 78. 2-(2,2-Difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-[[[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

25

Example 79. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 80. *N*-(4-Hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-
pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-
yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 81. *N*-(4-Hydroxyphenyl)-1-methyl-5-(6-{[(3*R*)-3-methyl-3,4-
dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-
pyrazol-4-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the general protocol of Example 1 using the
compound of Preparation 22 in Step A. The product obtained is finally dissolved in
acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a
lyophilisation step, the expected compound is obtained in the form of a solid.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀ H₄₂ N₆ O₆

[M+H]⁺ calculated: 703.3239

[M+H]⁺ measured: 703.3236

Example 82. *N*-(4-Hydroxyphenyl)-1-methyl-5-(6-{[(3*R*)-3-methyl-3,4-
dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-
pyrazol-4-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

The procedure is in accordance with the general protocol of Example 1 using the
compound of Preparation 23 in Step A.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₃₉ H₄₀ N₆ O₆

[M+H]⁺ calculated: 689.3082

[M+H]⁺ measured: 689.3085

Example 83. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 84. 2-(Difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 85. *N*-(4-Hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 86. 2-(2,2-Difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 87. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 88. *N*-(4-Hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

%C=65.97:66.15; %H=5.78:5.46; %N=10.26:10.24; %Cl=4.33:4.76

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₅ H₄₆ N₆ O₇

5 [M+H]⁺ calculated: 783.3501

[M+H]⁺ measured: 783.3502

Example 89. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 90.** *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 91. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 92. 1-Ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

20 The procedure is in accordance with the protocol described in Example 1, using the compounds from Preparations 20 and 3' in Step A and the compound from Preparation 1" in Step C. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

25 %C=64.99:65.61; %H=5.86:5.39; %N=11.37:11.43; %Cl=4.80:4.42

$[M+H]^+$ measured: 703.3236

Example 93. *N*-(4-Hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-([*(3S)*-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

5 *Elemental microanalysis: (% , theoretical:measured)*

%C=64.01:64.10; %H=5.90:5.63; %N=10.92:10.88; %Cl=4.61:4.70.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁ H₄₄ N₆ O₇

$[M+H]^+$ calculated: 733.3344

10 $[M+H]^+$ measured: 733.3345

Example 94. 1-(2-Fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-([*(3S)*-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

15 The procedure is in accordance with the protocol described in Steps A-D of Example 1, using the compounds from Preparations 21 and 3' in Step A and the compound from Preparation 1'' in Step C. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

20 %C=63.44:63.25; %H=5.59:5.09; %N=11.10:11.02; %Cl=4.68:4.74

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₄₁FN₆O₆

$[M+H]^+$ calculated: 721.3144

$[M+H]^+$ measured: 721.3147

Example 95. 1-(2,2-Difluoroethyl)-N-(4-hydroxyphenyl)-2-methyl-N-(1-methyl-1H-pyrazol-4-yl)-5-(6-([(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-1,3-benzodioxol-5-yl)-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 32 and the compound of Preparation 3' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=61.97:61.89; %H=5.33:5.04; %N=10.84:10.85; %Cl⁻=4.57:4.55

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₀ H₄₀ F₂ N₆ O₆

[M+H]⁺ calculated: 739.3050

[M+H]⁺ measured: 739.3052

Example 96. N-(4-Hydroxyphenyl)-2-methyl-5-(6-([(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl)-1,3-benzodioxol-5-yl)-N-(1-methyl-1H-pyrazol-4-yl)-1-[2-(morpholin-4-yl)ethyl]-1H-pyrrole-3-carboxamide hydrochloride

Step A: N-[4-[tert-Butyl(dimethyl)silyl]oxyphenyl]-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrazol-4-yl)-1-(2-morpholinoethyl)pyrrole-3-carboxamide

The compound obtained in Step E of Example 99 is dissolved in 6 mL of tetrahydrofuran. Sodium iodide (100 mg, 0.67 mmol) is added, followed by morpholine (0.21 mL, 2.53 mmol) dropwise. The reaction mixture is heated in a sealed flask at 90°C for 72 hours. After cooling, the solution is evaporated to dryness and the residue is purified by chromatography over silica gel using dichloromethane and methanol as eluants. The expected product is obtained in the form of a foam.

¹H NMR (500 MHz, dms^o-d₆) δ ppm: 7.7-7.45 (4 bs, 1 H), 7.2-6.9 (m, 4 H), 7.1-6.4 (m, 2 H), 7.1-6.9 (4 bs, 1 H), 7-6.8 (4 m, 2 H), 6.75/6.48 (d+bs, 2 H), 6.1 (4 bs, 2 H), 5.25-4.7

(4 bs, 1 H), 5.2-3.8 (m, 2 H), 4.9/4.65/3.8 (3 m, 1 H), 3.75 (4 s, 3 H), 3.5 (bs, 4 H), 3-2 (m, 10 H), 2.41/2.3 (2 bs, 3 H), 1.02/0.95/0.78 (3 bd, 3 H), 0.88 (m, 9 H), 0.1 (m, 6 H)

IR (ATR) cm^{-1} : 1626 δ >C=O amides

Step B: *N*-(4-Hydroxyphenyl)-2-methyl-5-(6- $\{[(3R)$ -3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1H-pyrazol-4-yl)-1-[2-(morpholin-4-yl)ethyl]-1H-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the protocol described in Step D of Example 1. The product obtained is finally subjected to a step of conversion into salt form in the presence of HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

High-resolution mass spectrometry (ESI+):

Empirical formula: $\text{C}_{40} \text{H}_{42} \text{N}_6 \text{O}_6$

$[\text{M}+\text{H}]^+$ calculated: 703.3239

$[\text{M}+\text{H}]^+$ measured: 703.3238

Example 97. *N*-(4-Hydroxyphenyl)-2-methyl-5-(6- $\{[(3R)$ -3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1-[2-(morpholin-4-yl)ethyl]-*N*-phenyl-1H-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the protocol described in Example 96 replacing the compound of Preparation 1" by that of Preparation 2".

Elemental microanalysis: (% , theoretical;measured)

%C=68.61:68.12; %H=5.89:5.23; %N=7.62:7.54; %Cl=4.82:4.66

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: $\text{C}_{42} \text{H}_{42} \text{N}_4 \text{O}_6$

$[\text{M}+\text{H}]^+$ calculated: 699.3177

$[\text{M}+\text{H}]^+$ measured: 699.3173

Example 98. 1-[2-(Dimethylamino)ethyl]-N-(4-hydroxyphenyl)-2-methyl-5-(6-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)-1,3-benzodioxol-5-yl)-N-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the protocol described in Example 27 replacing the compound of Preparation 1" by that of Preparation 2". The product obtained is finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

Elemental microanalysis: (% , theoretical:measured)

%C=69.30:69.20; %H=5.96:5.48; %N=8.08:8.08; %Cl=5.11:5.03

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₀ H₄₀ N₄ O₅

[M+H]⁺ calculated: 657.3071

[M+H]⁺ measured: 657.3066

Example 99. N-(4-Hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-5-(6-[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)-1,3-benzodioxol-5-yl)-N-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Step A: Ethyl 1-(2-benzyloxyethyl)-2-methyl-5-[6-[(3*R*)-3-methyl-3,4-dihydro-1*H*-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]pyrrole-3-carboxylate

The procedure is in accordance with the protocol described in Step A of Example 1 replacing the compound of Preparation 1 by that of Preparation 19.

¹H NMR (500 MHz, dmso-d₆) δ ppm: 7.35-6.95 (m, 9 H), 7-6.8 (several s, 2 H), 6.35-5.85 (several s, 1 H), 6.15 (several s, 2 H), 5.15-3.5 (several m, 4 H), 4.9/4.7/3.95 (several m, 1 H), 4.4 (m, 2 H), 4.2-3.95 (m, 2 H), 3.55 (m, 2 H), 3.1-2.35 (several m, 2 H), 2.5-2.2 (several s, 3 H), 1.25-1.1 (several m, 3 H), 1.05-0.7 (several d, 3 H)

Step B: *1-(2-Benzoyloxyethyl)-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]pyrrole-3-carboxylic acid*

The procedure is in accordance with the protocol described in Step B of Example 1.

IR (ATR) cm^{-1} : 3000-2500 ν -OH, 1675-1625 ν -C=O carboxylic acid + amide

5 **Step C:** *1-(2-Benzoyloxyethyl)-N-[4-[tert-butyl(dimethyl)silyl]oxyphenyl]-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrazol-4-yl)pyrrole-3-carboxamide*

The procedure is in accordance with the protocol described in Step C of Example 1.

10 **^1H NMR** (500 MHz, $\text{dms}\text{-d}_6$) δ ppm: 7.7-7.5 (several s, 1 H), 7.35-6.5 (several m, 11 H), 7.1-6.9 (several s, 1 H), 6.95-6.5 (several s, 2 H), 6.8/6.5 (m, 2 H), 6.05 (several s, 2 H), 5.25-4.7 (several s, 1 H), 5.1-3.6 (several m, 4 H), 4.85/4.6/3.75 (several m, 1 H), 4.3 (m, 2 H), 3.7 (2xs, 3 H), 3.4 (m, 2 H), 3.05-2.4 (several m, 2 H), 2.4-2.25 (several s, 3 H), 1-0.75 (several d, 3 H), 0.9 (several s, 9 H), 0.1 (several s, 6 H)

IR (ATR) cm^{-1} : 1629 ν >C=O amides

15 **Step D:** *N-[4-[tert-Butyl(dimethyl)silyl]oxyphenyl]-1-(2-hydroxyethyl)-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrazol-4-yl)pyrrole-3-carboxamide*

20 In a hydrogenating reactor, the compound of the above Step is dissolved in 30 mL of methanol. The solution is degassed by bubbling argon in, and palladium-on-carbon 10 % (550 mg) is added. The resulting suspension is stirred under a pressure of 1 bar of hydrogen for 15 hours, and then passed through a Whatman® filter. The catalyst is rinsed with methanol and the filtrate is evaporated *in vacuo*. The residue thereby obtained is purified by chromatography over silica gel using dichloromethane and methanol as eluants. The expected product is obtained in the form of an oil.

25 **^1H NMR** (500 MHz, pyridine-d_5) δ ppm: 7.7-7.4 (4 s, 1 H), 7.3-6.9 (m, 4 H), 7.1-6.8 (4 s, 1 H), 7-6.7 (m, 2 H), 6.9-6.4 (m, 2 H), 6.8-6.4 (4 m, 2 H), 6.1 (m, 2 H), 5.2/5/4.7 (4 s, 1 H), 5.15-3.9 (8 d, 2 H), 4.9-4.8 (m, 1 H), 4.9/4.7/3.85 (3 m, 1 H), 3.9-3.7 (m, 2 H), 3.75 (2 s, 3

H), 3.5-3.2 (m, 2 H), 3-2.4 (m, 2 H), 2.4-2.3 (4 s, 3 H), 1.05/0.95/0.75 (4 d, 3 H), 0.85 (bs, 9 H), 0.15-0 (m, 6 H)

IR (ATR) cm^{-1} : 3346 ν -OH primary alcohol, 1621 ν -C=O amides

Step E: 2-[3-[[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-(1-methyl-1H-pyrazol-4-yl)-carbamoyl]-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]pyrrol-1-yl]ethyl methanesulphonate

The compound of the above Step (2.37 g, 3.17 mmol) is dissolved in 30 mL of tetrahydrofuran. The reaction mixture is cooled to 0°C and there are successively added triethylamine (1.8 mL, 13.9 mmol) and, dropwise, methanesulphonyl chloride (0.40 mL, 5.17 mmol). The reaction mixture is stirred for 2 hours at 0°C. The reaction mixture is then poured into saturated aqueous sodium hydrogen carbonate solution and extracted 3 times with ethyl acetate. The organic phase is washed 3 times with brine, dried over MgSO_4 , filtered and then evaporated to dryness. The evaporation residue is used without purification in the next Step.

^1H NMR (500 MHz, $\text{dms}\text{-}d_6$) δ ppm: 7.7-7.45 (several s, 1 H), 7.25-6.4 (m, 8 H), 7.1-6.9 (several s, 1 H), 6.95-6.65 (several s, 2 H), 6.1 (several s, 2 H), 5.2-4.6 (several s, 1 H), 5.05-3.75 (several d, 2 H), 4.9/4.6/3.9/3.8 (several m, 1 H), 4.3-4.05 (m, 2 H), 4.2-3.95 (m, 2 H), 3.75/3.7 (2 s, 3 H), 3.05-2.5 (several m, 2 H), 3 (several s, 3 H), 2.45-2.3 (several s, 3 H), 1.05-0.75 (several d, 3 H), 0.9 (several s, 9 H), 0.1 (several s, 6 H)

IR (ATR) cm^{-1} : 1626 ν -C=O, 1349 ν - SO_2 , 1249 δ - CH_3 , 1172 ν - SO_2

Step F: N-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-1-[2-[2-methoxyethyl(methyl)amino]ethyl]-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrazol-4-yl)pyrrole-3-carboxamide

The compound of the above Step (1.33 mg, 1.61 mmol) is dissolved in 6 mL of tetrahydrofuran. Sodium iodide (100 mg, 0.67 mmol) is added, followed by dimethylamine (0.172 g, 1.932 mmol) dropwise. The reaction mixture is heated in a sealed flask at 60°C for 36 hours. After cooling, it is evaporated to dryness and purified by chromatography over silica gel using dichloromethane and ammonia-in-methanol as eluants. The expected product is obtained in the form of a foam.

¹H NMR (500 MHz, dms^o-d₆) δ ppm 7.7-7.45 (4 bs, 1 H), 7.2-6.9 (m, 4 H), 7.1-6.9 (4 bs, 1 H), 7-6.7 (4 m, 2 H), 7/6.45 (2 m, 2 H), 6.8/6.45 (2 m, 2 H), 6.1 (m, 2 H), 5.22/5.05/4.7 (4 bs, 1 H), 5.2-3.8 (m, 2 H), 4.91/4.65/3.9 (3 m, 1 H), 3.75 (2 bs, 3 H), 3.7 (m, 2 H), 3.2 (bs, 3 H), 3-2 (m, 2 H), 2.7-2 (ml, 6 H), 2.7-2 (m, 3 H), 2.45/2.35 (2 bs, 3 H),
5 1.05/0.95/0.8 (3 bd, 3 H), 0.9 (m, 9 H), 0.1 (m, 6 H)

IR (ATR) cm⁻¹: 1628 (shoulder) δ -C=O amides

Step G: N-(4-hydroxyphenyl)-1-[2-[2-methoxyethyl(methyl)amino]ethyl]-2-methyl-5-[6-[(3R)-3-methyl-3,4-dihydro-1H-isoquinoline-2-carbonyl]-1,3-benzodioxol-5-yl]-N-(1-methyl-1H-pyrazol-4-yl)pyrrole-3-carboxamide hydrochloride

10 The procedure is in accordance with the protocol described in Step D of Example 1. The product obtained is finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

15 IR (ATR) cm⁻¹: 2000 to 3500 ν -NH⁺/OH, 1615 ν >C=O amides, 1237-1161 δ >C-O-C<, 745 ν >CH-Ar

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀ H₄₄ N₆ O₆

[M+H]⁺ calculated: 705.3395

[M+H]⁺ measured: 705.3391

20 ***Example 100. 5-(5-Fluoro-4-methoxy-2-[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazol-4-yl)-1H-pyrrole-3-carboxamide hydrochloride***

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations. The product obtained is finally dissolved in acetonitrile and

converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

%C=64.23:64.31; %H=5.80:5.43; %N=11.52:11.46; %Cl=4.86:4.95

5 ***High-resolution mass spectrometry (ESI+):***

Empirical formula: C₃₉ H₄₁ F N₆ O₅

[M+H]⁺ calculated: 693.3195

[M+H]⁺ measured: 693.3194

10 **Example 101. 5-(4-Fluoro-5-methoxy-2-(((3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

15 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 27 and the compound of Preparation 3' in Step A, and the compound of Preparation 1'' in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.23:63.12; %H=5.80:5.20; %N=11.52:11.38. %Cl⁻=4.86:5.03

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₉ H₄₁ F N₆ O₅

20 [M+H]⁺ calculated: 693.3195

[M+H]⁺ measured: 693.3195

Example 102. 5-(5-Chloro-2-(((3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide trihydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₃ H₄₄ Cl N₇ O₃

[M+H]⁺ calculated: 742.3267

[M+H]⁺ measured: 742.3268

5 **Example 103.** 5-(5-Chloro-2-{[(3*S*)-3-[(4-methylpiperazin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

10 **Example 104.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 105. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

15 **Example 106.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations, it being understood that Step D is not carried out. The expected product is obtained in free base form.

20 **Elemental microanalysis: (% , theoretical:measured)**

%C=70.72:69.77; %H=5.79:5.96; %N=11.78:11.43

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂ H₄₁ Cl N₆ O₃

[M+H]⁺ calculated: 713.3001

25 [M+H]⁺ measured: 713.2998

Example 107. 5-(5-Chloro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 108. 5-(5-Chloro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(5-cyano-1-methyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and (3*S*)-3-(4-morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline (see Preparation 3') in Step A, and the compound of Preparation 19" in Step C. The product obtained is finally subjected to a step of conversion into salt form in the presence of HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

Elemental microanalysis: (% , theoretical:measured)

%C=64.95:65.09; %H=5.45:5.20; %N=11.36:11.26; %Cl=4.79:4.62

High-resolution mass spectrometry (ESI/+):

Empirical formula: C₄₀ H₃₉ Cl N₆ O₄

[M+H]⁺ calculated: 703.2794

[M+H]⁺ measured: 703.2789

Example 109. 5-(5-Chloro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(6-cyanopyridin-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 23" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI⁺/FLA/HR, ESI⁻/FLA):

Empirical formula: C₄₀ H₃₇ Cl N₆ O₄

[M+H]⁺ calculated: 701.2638

[M+H]⁺ measured: 701.2639

- 5 **Example 110.** 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-cyanopyridin-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.13:65.72; %H=5.19:4.76; %N=11.39:12.04; %Cl=4.81:4.45

- 10 *High-resolution mass spectrometry (ESI⁺/FLA/HR, ESI⁻/FLA):*

Empirical formula: C₄₀ H₃₇ Cl N₆ O₄

[M+H]⁺ calculated: 701.2638

[M+H]⁺ measured: 701.2643

- 15 **Example 111.** 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-cyanopyrimidin-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

Example 112. 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[2-(dimethylamino)pyridin-4-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

- 20 **Example 113.** 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-benzimidazol-5-yl)-1*H*-pyrrole-3-carboxamide

- 25 **Example 114.** 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyrazolo[1,5-*a*]pyrimidin-6-yl)-1*H*-pyrrole-3-carboxamide

Example 115. 5-(5-Chloro-2-{[(3*S*)-3-[(9*aS*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

5 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 7' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

10 %C=61.01:60.17; %H=5.74:5.09; %N=12.15:12.02; %Cl=8.78:9.81

High-resolution mass spectrometry (ESI+/-FIA/HR, ESI-/FIA):

Empirical formula: C₄₁ H₄₄ Cl N₇ O₄

[M+H]⁺ calculated: 734.3216

[M+H]⁺ measured: 734.3220

15 **Example 116.** 5-(5-Chloro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 9' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=61.01:61.90; %H=5.74:5.65; %N=12.15:12.14; %Cl=13.15:11.51

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₁ H₄₄ Cl N₇ O₄

[M+H]⁺ calculated: 734.3216

[M+H]⁺ measured: 734.3218

5 **Example 117.** 5-(5-Chloro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 118.** 5-(5-Chloro-2-{[(3*S*)-3-(difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 119. 5-(5-Chloro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

15 **Example 120.** 5-(5-Chloro-2-{[(3*S*)-3-[(3-cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 121. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(1-ethyl-1*H*-pyrazol-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

20 **Example 122.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(1-cyclopropyl-1*H*-pyrazol-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

25 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 28" in Step C.

Elemental microanalysis: (% , theoretical:measured)

%C=68.12:67.94; %H=5.86:5.77; %N=11.92:11.65

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₀ H₄₁ Cl N₆ O₄

5 [M+H]⁺ calculated: 705.2951

[M+H]⁺ measured: 705.2952

Example 123. 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-[1-(trifluoromethyl)-1H-pyrazol-4-yl]-1H-pyrrole-3-carboxamide

10 **Example 124.** 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-[1-(difluoromethyl)-1H-pyrazol-4-yl]-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide

Example 125. 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-N-[1-(2-methoxyethyl)-1H-pyrazol-4-yl]-1,2-dimethyl-1H-pyrrole-3-carboxamide

15

Example 126. 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-[1-(oxetan-3-yl)-1H-pyrazol-4-yl]-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 26" in Step C.

20

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₀ H₄₁ Cl N₆ O₅

[M+H]⁺ calculated: 721.2900

25 [M+H]⁺ measured: 721.2902

Example 127. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(tetrahydrofuran-3-yl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 22" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical; measured)

%C=63.81:63.63; %H=5.75:5.74; %N=10.89:10.71; %Cl=4.59:4.52

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₁ H₄₃ Cl N₆ O₅

[M+H]⁺ calculated: 735.3056

[M+H]⁺ measured: 735.3061

Example 128. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[1-(2-hydroxy-2-methylpropyl)-1*H*-pyrazol-4-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

Example 129. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]-pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 106 as starting material, it being understood that the product is not subjected to the step of conversion into salt form.

Elemental microanalysis: (% , theoretical; measured)

%C=70.53:70.51; %H=6.06:5.81; %N=11.75:11.71

High-resolution mass spectrometry (ESI+/-FIA):

Empirical formula: C₄₂ H₄₃ Cl N₆ O₃

[M+H]⁺ calculated: 715.3158

[M+H]⁺ measured: 715.3159

5 **Example 130.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 131.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

Example 132. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

15 **Example 133.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 134. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 135.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

25 **Example 136.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 137. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

5 **Example 138.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 139. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 140.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

15 **Example 141.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 142. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 143.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 144. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 145. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 146. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 147. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 148. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2-fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 149. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2-fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 150. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2-fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 151. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 152. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 153. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

5 Example 154. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 155. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

10 Example 156. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

15 Example 157. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 158. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

20 Example 159. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 160. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-1-[2-(morpholin-4-yl)ethyl]-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 161. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-[2-(dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 162. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-[2-(dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 163. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-[2-(dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 164. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1-[2-(dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 165. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 166. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 167. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 168. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 169. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 170. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 171. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 172. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 173. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 174. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 175. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 176. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 177. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 178. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 179. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 180. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 181. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 182. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-2-(2,2-difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 183. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 184. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

5 **Example 185.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 186. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

10 **Example 187.** 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

15 **Example 188.** 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

Example 189. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

20 **Example 190.** 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 191. 5-(5-Chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 192. 5-(5-Chloro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 193. 5-(5-Chloro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 194. 5-(5-Chloro-2-{[(3*S*)-3-(difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 195. 5-(5-Chloro-2-{[(3*S*)-3-(difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 196. 5-(5-Chloro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 197. 5-(5-Chloro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 198. 5-(5-Chloro-2-{[(3*S*)-3-[(9*aS*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 199. 5-(5-Chloro-2-{[(3*S*)-3-[(9*aS*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-

hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 200. 5-(5-Chloro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 201. 5-(5-Chloro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 202. 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-chlorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 203. 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-chlorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 204. 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-chlorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 205. 5-(5-Chloro-2-{[(3*S*)-3-[(3-cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 206. 5-(5-Chloro-2-{[(3*S*)-3-[(3-cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 207. 5-(5-Chloro-2-{[(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 8' in Step A, and the compound of Preparation 1" in Step C.

High-resolution mass spectrometry (ESI+/-/FIA/HR, ESI-/FIA):

Empirical formula: C₃₉ H₃₉ Cl N₆ O₄

[M+H]⁺ calculated: 691.2794

[M+H]⁺ measured: 691.2796

Example 208. 5-(5-Chloro-2-{[(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 209. 5-(5-Fluoro-4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

%C=66.27:66.84; %H=5.69:5.15; %N=10.78:10.71; %Cl=4.55:4.46

High-resolution mass spectrometry (ESI+/-/FIA):

Empirical formula: C₄₃ H₄₃ F N₆ O₅

[M+H]⁺ calculated: 743.3352

[M+H]⁺ measured: 743.3353

Example 210. 5-(5-Fluoro-4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

5 **Step A:** 5-(5-Fluoro-4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the compound of Preparation 14 and (3*S*)-3-(4-morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline (see Preparation 3') in Step A, and the compound of Preparation 11" in Step C.

10 **Step B:** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process described in Step B of Example 49 starting from compound of the above Step, it being understood that the product is finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected product is obtained.

Elemental microanalysis: (% , theoretical:measured)

20 %C=60.12:59.77; %H=4.92:4.76; %N=10.79:10.39; %Cl=4.55:5.17

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₀ H₄₀ N₄ O₅

[M+H]⁺ calculated: 657.3071

[M+H]⁺ measured: 657.3066

Example 211. 5-(4-Fluoro-5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 212. 5-(4-Fluoro-5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 213. *N*-(1-Ethyl-1*H*-pyrazol-4-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

Example 214. *N*-(1-Cyclopropyl-1*H*-pyrazol-4-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 28" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical; measured)

%C=66.24:66.53; %H=5.84:5.39; %N=10.59:10.92 %Cl=4.89:5.68

Example 215. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trifluoromethyl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

Example 216. *N*-[1-(Difluoromethyl)-1*H*-pyrazol-4-yl]-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

Example 217. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*-[1-(2-methoxyethyl)-1*H*-pyrazol-4-yl]-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

5 Example 218. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(oxetan-3-yl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

Example 219. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(tetrahydrofuran-3-yl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

10 Example 220. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[1-(2-hydroxy-2-methylpropyl)-1*H*-pyrazol-4-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

15 Example 221. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 222. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

20 Example 223. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 224. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 225. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*,1,2-trimethyl-1*H*-pyrrole-3-carboxamide

Example 226. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 227. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 228. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 229. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 230. *N*-(5-Cyano-1-methyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 19" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% theoretical:measured)

%C=66.43:67.09; %H=5.57:5.21; %N=11.62:11.48 %Cl=4.90:4.75

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₀H₃₉FN₆O₄

[M+H]⁺ calculated: 687.3097

[M+H]⁺ measured: 687.3073

5 **Example 231.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 232.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 233. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

15 **Example 234.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 235. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 236.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

25 **Example 237.** 1-Ethyl-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 238. 1-Ethyl-5-(5-fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 239. 1-Ethyl-5-(5-fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 240. 5-(5-Fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 241. 5-(5-Fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 242. 5-(5-Fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 243. 1-(2-Fluoroethyl)-5-(5-fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 244. 1-(2-Fluoroethyl)-5-(5-fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 245. 1-(2-Fluoroethyl)-5-(5-fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 246. 1-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 247. 1-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 248. 1-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 249. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 250. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 251. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 252. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 253. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 254. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 255. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-1-[2-(morpholin-4-yl)ethyl]-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 256. 1-[2-(Dimethylamino)ethyl]-5-(5-fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 257. 1-[2-(Dimethylamino)ethyl]-5-(5-fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 258. 1-[2-(Dimethylamino)ethyl]-5-(5-fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 259. 1-[2-(Dimethylamino)ethyl]-5-(5-fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 260. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 261. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 262. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

5 **Example 263.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

10 **Example 264.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 265. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

15 **Example 266.** 2-(Difluoromethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 267. 2-(Difluoromethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 268.** 2-(Difluoromethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 269. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 270. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 271. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 272. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 273. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 274. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 275. 2-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 276. 2-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 277. 2-(2,2-Difluoroethyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 278. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 279. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 280. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 281. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

Example 282. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

Example 283. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

Example 284. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 285. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 286. 5-(5-Fluoro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 287. 5-(5-Fluoro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 288. 5-(5-Fluoro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 289. 5-(5-Fluoro-2-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 290. 5-(2-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 291. 5-(2-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 292. 5-(2-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 293. 5-(5-Fluoro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 294. 5-(5-Fluoro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 295. 5-(5-Fluoro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 296. 5-(5-Fluoro-2-{[(3*S*)-3-(fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 297. 5-(5-Fluoro-2-{[(3*S*)-3-[(9*aS*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 298. 5-(5-Fluoro-2-{[(3*S*)-3-[(9*aS*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 299. 5-(5-Fluoro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 300. 5-(5-Fluoro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

5 **Example 301.** 5-(5-Fluoro-2-{[(3*S*)-3-[(9*aR*)-hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

10 **Example 302.** 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 303. 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

15 **Example 304.** 5-(2-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

20 **Example 305.** 5-(2-{[(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 306. 5-(2-{[(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 307. 5-(2-{{(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-5-fluorophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 308. 5-(5-Fluoro-2-{{(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 309. 5-(5-Fluoro-2-{{(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 310. *N*-(1-Ethyl-1*H*-pyrazol-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 311. *N*-(1-Cyclopropyl-1*H*-pyrazol-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 312. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-[1-(trifluoromethyl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

Example 313. *N*-[1-(Difluoromethyl)-1*H*-pyrazol-4-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 314. *N*-(4-Hydroxyphenyl)-*N*-[1-(2-methoxyethyl)-1*H*-pyrazol-4-yl]-1,2-dimethyl-5-(6-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 315. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-[1-(oxetan-3-yl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

Example 316. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-[1-(tetrahydrofuran-3-yl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide

Example 317. *N*-[1-(2-Hydroxy-2-methylpropyl)-1*H*-pyrazol-4-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 318. 1,2-Dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 319. 1,2-Dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 320. *N*-(4-Fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 321. *N*-(4-Fluorophenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 322. *N*-(4-Hydroxyphenyl)-*N*,1,2-trimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 323. *N*-(2-Hydroxypyrimidin-5-yl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

Example 324. *N*-(2-Hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 325. *N*-(2-Hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 326. *N*-(2-Hydroxypyrimidin-5-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 327. *N*-(5-Cyano-1-methyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 328. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 329. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 330. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-
benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 331. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-
5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-
yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 332. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo-
[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-
2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 333. 1-Ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]-
pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-
carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 334. 1-Ethyl-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-
pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroiso-
quinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 335. *N*-(4-Hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-1*H*-
pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroiso-
quinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 336. *N*-(4-Hydroxyphenyl)-1-(2-methoxyethyl)-2-methyl-*N*-(1-methyl-2,3-
dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-
dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-
carboxamide

Example 337. 1-(2-Fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 338. 1-(2-Fluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 339. 1-(2,2-Difluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 340. 1-(2,2-Difluoroethyl)-*N*-(4-hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 341. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 342. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 343. *N*-(4-Hydroxyphenyl)-2-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 344. *N*-(4-Hydroxyphenyl)-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 345. *N*-(4-Hydroxyphenyl)-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 346. 1-[2-(Dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 347. 1-[2-(Dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 348. 1-[2-(Dimethylamino)ethyl]-*N*-(4-hydroxyphenyl)-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 349. *N*-(4-Hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 350. *N*-(4-Hydroxyphenyl)-1-{2-[(2-methoxyethyl)(methyl)amino]ethyl}-2-methyl-5-(6-{{(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 351. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{{(3*S*)-3-(morpholin-4-yl)methyl}-3,4-dihydroisoquinolin-

2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(trifluoromethyl)-1*H*-pyrrole-3-carboxamide

Example 352. 2-(Difluoromethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 353. *N*-(4-Hydroxyphenyl)-2-(methoxymethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 354. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 355. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 356. *N*-(4-Hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-2-(2,2,2-trifluoroethyl)-1*H*-pyrrole-3-carboxamide

Example 357. 2-(2,2-Difluoroethyl)-*N*-(4-hydroxyphenyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 358. *N*-(4-Hydroxyphenyl)-2-(2-methoxyethyl)-1-methyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

- 5 The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 88 as starting material, it being understood that the product is finally dissolved in acetonitrile and converted into salt form in 0.1M aqueous HCl solution. After a lyophilisation step, the expected product is obtained in the form of a solid.

Elemental microanalysis: (% , theoretical:measured)

- 10 %C=65.80:64.71; %H=6.01:5.74; %N=10.23:10.03; %Cl=4.32:6.47

High-resolution mass spectrometry (ESI/+):

Empirical formula: C₄₅ H₄₈ N₆ O₇

[M+H]⁺ calculated: 785.3657

[M+H]⁺ measured: 785.3658

- 15 **Example 359.** *N*-(4-Hydroxyphenyl)-1-methyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-(morpholin-4-ylmethyl)-1*H*-pyrrole-3-carboxamide

- 20 **Example 360.** *N*-(4-Hydroxyphenyl)-1-methyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-2-[2-(morpholin-4-yl)ethyl]-1*H*-pyrrole-3-carboxamide

Example 361. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

- 25 **Example 362.** *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 363. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{[(3*S*)-3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 364. 5-(6-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 365. 5-(6-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 366. 5-(6-{[(3*S*)-3-(Difluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 367. 5-(6-{[(3*S*)-3-(Fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 368. 5-(6-{[(3*S*)-3-(Fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 369. 5-(6-{[(3*S*)-3-(Fluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 370. 5-(6-{[(3*S*)-3-[(9*aS*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-

hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 371. 5-(6-{[(3*S*)-3-[(9*aS*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 372. 5-(6-{[(3*S*)-3-[(9*aS*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 373. 5-(6-{[(3*S*)-3-[(9*aR*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 374. 5-(6-{[(3*S*)-3-[(9*aR*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 375. 5-(6-{[(3*S*)-3-[(9*aR*)-Hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 376. 5-(6-{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 377. 5-(6-{{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 378. 5-(6-{{[(3*S*)-3-(Aminomethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 379. 5-(6-{{[(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide

Example 380. 5-(6-{{[(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 381. 5-(6-{{[(3*S*)-3-[(3-Cyanoazetidin-1-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide

Example 382. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{{[(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 383. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-5-(6-{{[(3*S*)-3-(1-oxa-6-azaspiro[3.3]hept-6-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide

Example 384. 5-(5-Fluoro-2-{{[(3*S*)-3-(morpholin-4-yl)methyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=67.28:67.73; %H=5.65:5.30; %N=10.06:9.41 %Cl=5.09:5.79

Example 385. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 713.3253

[M+H]⁺ measured: 713.3272

Example 386. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Step A: *N*-[4-[*tert*-Butyl(dimethyl)silyl]oxyphenyl]-5-[5-chloro-2-[(3*S*)-3-(morpholino-methyl)-3,4-dihydro-1*H*-isoquinoline-2-carbonyl]phenyl]-*N*-(5-cyano-1,2-dimethyl-pyrrol-3-yl)-1,2-dimethyl-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C.

IR: ν -CN-: 2210 cm⁻¹; ν -C=O-: 1631 cm⁻¹

Step B: 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The compound of Step A is deprotected in accordance with the protocol described in Step D of Example 1. The product thereby obtained is finally subjected to a step of conversion into salt form in the presence of HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected product is obtained.

¹H NMR (500 MHz, dms_o-d₆) δ ppm: 11.2 (bs, 1H), 9.39 (bs, 1H), 7.83 (d, 1 H), 7.54 (d, 1 H), 7.33 (s, 1 H), 7.14 (m, 2 H), 7 (m, 2 H), 6.8 (d, 2 H), 6.62 (d, 2 H), 6.57 (bs, 1 H), 5.26 (s, 1 H), 5.26 (m, 1 H), 4.64/4.03 (AB, 2 H), 4.01/3.92 (2m, 4 H), 3.75/3.43/3.15/3.02 (4m, 4 H), 3.59 (s, 3 H), 3.3/3.15 (2m, 2 H), 2.97 (s, 3 H), 2.69/2.52 (dd+d, 2 H), 2.06 (s, 3 H), 1.91 (s, 3 H)

Elemental microanalysis: (% theoretical:measured)

%C=65.34:65.50; %H=5.62:5.15; %N=11.15:10.84 %Cl=4.70:4.44

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 717.2952

[M+H]⁺ measured: 717.2951

Example 387. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*c*]pyridin-5-yl)-5-(6-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% theoretical:measured)

%C=66.62:66.36; %H=5.59:5.62; %N=10.84:10.72 %Cl=4.57:4.55

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₃ H₄₂ N₆ O₆

[M+H]⁺ calculated: 739.3239

[M+H]⁺ measured: 739.3241

Example 388. 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 71 as starting material, it being understood that the product is

finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

Elemental microanalysis: (% theoretical:measured)

5 %C=62.73:62.96; %H=5.64:4.95; %N=10.45:10.32; %Cl=13.23:12.91

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂ H₄₃ Cl N₆ O₄

[M+H]⁺ calculated: 731.3107

[M+H]⁺ measured: 731.3111

10 **Example 389. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*c*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

15 The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

Elemental microanalysis: (% theoretical:measured)

%C=65.88:66.28; %H=5.53:5.15; %N=10.98:10.95; %Cl=4.63:4.47

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

20 Empirical formula: C₄₂ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 729.2951

[M+H]⁺ measured: 729.2954

Example 390. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations, it being understood that Step D is not carried out. The expected product is obtained in free base form.

Elemental microanalysis: (% , theoretical:measured)

%C=70.72:69.77; %H=5.79:5.96; %N=11.78:11.43

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₂ H₄₁ Cl N₆ O₃

[M+H]⁺ calculated: 713.3001

[M+H]⁺ measured: 713.2998

Example 391. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[3,2-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.88:65.69; %H=5.33:4.87; %N=10.98:10.86; %Cl=4.63:4.51

High-resolution mass spectrometry (ESI+/-/FIA):

Empirical formula: C₄₂ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 729.2951

[M+H]⁺ measured: 729.2953

Example 392. 5-(5-Chloro-2-{[(3*R*)-3-[3-(morpholin-4-yl)propyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=68.19:68.33; %H=6.00:5.49; %N=10.78:10.71; %Cl=4.55:4.46; %Cl = 9.58:9.78

High-resolution mass spectrometry (ESI+/-/FIA):

Empirical formula: C₄₂ H₄₃ Cl N₄ O₄

5 [M+H]⁺ calculated: 703.3046

[M+H]⁺ measured: 703.3042

Example 393. 5-(5-Chloro-2-{[(3*R*)-3-[3-(morpholin-4-yl)propyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

10 ***High-resolution mass spectrometry (ESI+/-/FIA):***

Empirical formula: C₄₄ H₄₅ Cl N₆ O₄

[M+H]⁺ calculated: 757.3264

[M+H]⁺ measured: 757.3263

Example 394. 5-(5-Chloro-2-{[(3*R*)-3-[3-(morpholin-4-yl)propyl]-3,4-

15 ***dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide***

The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 393 as starting material, it being understood that the product is not subjected to the step of conversion into salt form.

20 ***Elemental microanalysis: (% , theoretical:measured)***

%C=69.60:69.56; %H=6.21:6.24; %N=11.07:11.08

High-resolution mass spectrometry (ESI+/-/FIA):

Empirical formula: C₄₄ H₄₇ Cl N₆ O₄

[M+H]⁺ calculated: 759.3420

25 [M+H]⁺ measured: 759.3422

Example 395. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(3-cyano-4-methoxyphenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the general protocol of Example 1 using the appropriate Preparations. The product obtained is finally dissolved in acetonitrile and converted into salt form using 0.1M aqueous HCl solution. After a lyophilisation step, the expected compound is obtained in the form of a solid.

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₂ H₄₀ Cl N₅ O₅

[M+H]⁺ calculated: 730.2791

[M+H]⁺ measured: 730.2790

Example 396. *N*-(3-Fluoro-4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 11 and (3*S*)-3-(4-morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline (see Preparation 3') in Step A, and the compound of Preparation 20" in Step C. The product obtained is finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the expected compound is obtained.

Elemental microanalysis: (% , theoretical:measured)

%C=65.79:65.43; %H=5.39:5.19; %N=11.31:11.21; %Cl=4.77:4.34

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₃₉ H₃₉ F N₆ O₆

[M+H]⁺ calculated: 707.2988

[M+H]⁺ measured: 707.2988

Example 397. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

High-resolution mass spectrometry (ESI+):

5 Empirical formula: C₃₉ H₃₉ Cl N₆ O₅

[M+H]⁺ calculated: 707.2743

[M+H]⁺ measured: 707.2746

Example 398. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(3-cyanophenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=66.85:66.75; %H=5.34:5.42; %N=9.51:9.73; %Cl=9.62:9.67; %Cl⁻=4.81:4.71

High-resolution mass spectrometry (ESI+/-/FLA/HR, ESI-/FLA):

Empirical formula: C₄₁ H₃₈ Cl N₅ O₄

15 [M+H]⁺ calculated: 700.2685

[M+H]⁺ measured: 700.2686

Example 399. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(3-fluoro-4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and (3*S*)-3-(4-morpholinylmethyl)-1,2,3,4-tetrahydroisoquinoline (see Preparation 3') in Step A, and the compound of Preparation 20" in Step C. The product obtained is finally subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the
25 expected compound is obtained.

Elemental microanalysis: (% , theoretical:measured)

%C=62.21:61.32; %H=5.36:5.18; %N=11.46:11.14; %Cl= 9.66:10.16; %Cl⁻=4.83:5.23

High-resolution mass spectrometry (ESI+/-FIA/HR, ESI-/FIA):

Empirical formula: C₃₈ H₃₈ Cl F N₆ O₄

5 [M+H]⁺ calculated: 697.2700

[M+H]⁺ measured: 697.2704

Example 400. Methyl 2-[[5-(5-chloro-2-[[[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydro-isoquinolin-2(1H)-yl]carbonyl]phenyl)-1,2-dimethyl-1H-pyrrol-3-yl]carbonyl](4-hydroxyphenyl)amino]pyridine-4-carboxylate hydrochloride

10 The title compound is a secondary product which forms in the course of synthesis of Example 110 (in the final Step before the step of conversion into salt form) owing to hydrolysis of the nitrile function into a methyl ester function. The compound is separated from that of Example 110 by chromatography over silica gel in a mixture of methanol and dichloromethane.

15 ***Elemental microanalysis: (% , theoretical:measured)***

%C=63.90:64.43; %H=5.36:5.01; %N=9.09:9.34; %Cl⁻=4.60:4.46

High-resolution mass spectrometry (ESI+/HR and ESI-/LR):

Empirical formula: C₄₁ H₄₀ Cl N₅ O₆

[M+H]⁺ calculated: 734.2740

20 [M+H]⁺ measured: 734.2743

Example 401. 5-(5-Chloro-2-[[[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-N-(3-cyano-4-fluorophenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

25 %C=65.25:64.23; %H=5.07:4.71; %N=9.28:9.36; %Cl= 9.40:9.59; %Cl⁻=4.70:4.50

High-resolution mass spectrometry (ESI⁺/FIA/HR, ESI⁻/FIA):

Empirical formula: C₄₁ H₃₇ Cl F N₅ O₄

[M+H]⁺ calculated: 718.2591

[M+H]⁺ measured: 718.2593

5 **Example 402.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-{1-[(3*S* or *R*)-tetrahydrofuran-3-yl]-1*H*-pyrazol-4-yl}-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.20:65.92; %H=5.87:5.78; %N=11.13:10.36 %Cl⁻=4.69:4.79)

10 ***High-resolution mass spectrometry (ESI⁺):***

Empirical formula: C₄₁H₄₃FN₆O₅

[M+H]⁺ calculated: 719.3359

[M+H]⁺ measured: 719.3362

and

15 **Example 403.** 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-{1-[(3*R* or *S*)-tetrahydrofuran-3-yl]-1*H*-pyrazol-4-yl}-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.20:66.04; %H=5.87:5.87; %N=11.13:10.62; %Cl⁻=4.69:4.76

20 ***High-resolution mass spectrometry (ESI⁺):***

Empirical formula: C₄₁H₄₃FN₆O₅

[M+H]⁺ calculated: 719.3359

[M+H]⁺ measured: 719.3350

25 The compounds of Examples 402 and 403 are obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A,

and the compound of Preparation 22" in Step C. The diastereoisomers obtained are separated by chiral chromatography and then converted into salt form and lyophilised as described in the general process to yield the title compounds.

Example 404. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(2-cyanopyrimidin-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Example 405. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-*N*-(pyridazin-4-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C, it being understood that Step D is not carried out. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI⁺-/FIA/HR, ESI-/FIA):

Empirical formula: C₄₀ H₃₉ Cl N₈ O₃

[M+H]⁺ calculated: 715.2906

[M+H]⁺ measured: 715.2909

Example 406. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 25 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=68.46:68.27; %H=6.03:5.12; %N=11.68:11.75; %Cl=4.93:4.73

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):

Empirical formula: C₄₁ H₄₂ N₆ O₄

[M+H]⁺ calculated: 683.3340

[M+H]⁺ measured: 683.3334

Example 407. *N*-(3-Fluoro-4-hydroxyphenyl)-5-(5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 12 and the compound of Preparation 3' in Step A, and the compound of Preparation 20" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.23:63.94; %H=5.80:5.00; %N=11.52:11.56; %Cl=4.86:4.99

High-resolution mass spectrometry (ESI+/-/FIA/HR and MS/MS, ESI-/FIA):

Empirical formula: C₃₉ H₄₁ F N₆ O₅

[M+H]⁺ calculated: 693.3195

[M+H]⁺ measured: 693.3191

Example 408. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-5-(5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 12 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.32:67.30; %H=6.05:5.28; %N=11.22:11.15; %Cl=4.73:4.59

High-resolution mass spectrometry (ESI+/-FIA/HR and ESI-/FIA):

Empirical formula: C₄₂ H₄₄ N₆ O₅

[M+H]⁺ calculated: 713.3446

[M+H]⁺ measured: 713.3443

5 **Example 409. N-(4-Hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrrolo[2,3-b]-pyridin-5-yl)-5-(2-([(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl})phenyl)-1H-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 25 and the compound of Preparation 3' in Step A, and the compound of Preparation 11" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=68.98:68.95; %H=5.93:4.76; %N=11.49:11.43

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

15 Empirical formula: C₄₂ H₄₂ N₆ O₄

[M+H]⁺ calculated: 695.3340

[M+H]⁺ measured: 695.3341

20 **Example 410. N-(4-Hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-2,3-dihydro-1H-pyrrolo[2,3-b]pyridin-5-yl)-5-(2-([(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl})phenyl)-1H-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 409 as starting material. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI/FIA/HR and ESI-/FIA):

Empirical formula: C₄₂ H₄₄ N₆ O₄

[M+H]⁺ calculated: 697.3497

[M+H]⁺ measured: 697.3497

5 **Example 411. 5-(5-Chloro-2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-2-methyl-N-(1-methyl-1H-pyrazol-4-yl)-1-[2-(morpholin-4-yl)ethyl]-1H-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 96 using the acid of Preparation 30, the compound of Preparation 1', and the compound of Preparation 1". The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₃₉ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 693.2951

15 [M+H]⁺ measured: 693.2947

Example 412. 5-(5-Chloro-2-{[(3R)-3-[3-(morpholin-4-yl)propyl]-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(5-cyano-1,2-dimethyl-1H-pyrrol-3-yl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 6' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% theoretical:measured)

%C=66.06:65.61; %H=5.93:5.22; %N=10.75:10.69; %Cl=4.53:4.68

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):

Empirical formula: C₄₃ H₄₅ Cl N₆ O₄

[M+H]⁺ calculated: 745.3264

[M+H]⁺ measured: 745.3260

5 **Example 413. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(7-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl)-2,3-dihydro-1,4-benzodioxin-6-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 13 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=66.44:66.40; %H=5.83:4.84; %N=10.81:10.79; %Cl=4.56:4.22

15 ***High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):***

Empirical formula: C₄₃ H₄₄ N₆ O₆

[M+H]⁺ calculated: 741.3395

[M+H]⁺ measured: 741.3397

20 **Example 414. 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl)phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(5-methyl-5*H*-pyrrolo[3,2-*d*]pyrimidin-2-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

25 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.23:64.38; %H=5.39:5.25; %N=12.79:12.62; %Cl=4.62:4.39

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):

Empirical formula: C₄₁ H₄₀ Cl N₇ O₄

[M+H]⁺ calculated: 730.2903

[M+H]⁺ measured: 730.2904

5 **Example 415.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1-methyl-1*H*-pyrrole-3-carboxamide hydrochloride

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 3 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.95:65.14; %H=5.45:5.34; %N=11.36:11.36; %Cl=4.79:4.67

High-resolution mass spectrometry (ESI+/-/FIA/HR, ESI-/FIA):

15 Empirical formula: C₄₀ H₃₉ Cl N₆ O₄

[M+H]⁺ calculated: 703.2794

[M+H]⁺ measured: 703.2795

20 **Example 416.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trideuterio-methyl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 25" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 ***Elemental microanalysis: (% , theoretical:measured)***

%C=63.51:63.41; %H=5.63:5.42; %N=11.69:11.61; %Cl=4.93:4.85

High-resolution mass spectrometry (ESI⁺-/FIA/HR, ESI-/FIA):

Empirical formula: C₃₈ H₃₆ Cl D₃ N₆ O₄

[M+H]⁺ calculated: 682.2982

[M+H]⁺ measured: 682.2986

5 **Example 417. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-5-(4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 31 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.32:67.56; %H=6.05:5.84; %N=11.22:11.21; %Cl⁻=4.73:4.71

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):

15 Empirical formula: C₄₂ H₄₄ N₆ O₅

[M+H]⁺ calculated: 713.3446

[M+H]⁺ measured: 713.3446

20 **Example 418. *N*-(4-Hydroxyphenyl)-5-(4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 31 and the compound of Preparation 3' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 ***Elemental microanalysis: (% , theoretical:measured)***

%C=65.86:65.51; %H=6.09:6.09; %N=11.82:11.73; %Cl⁻=4.98:5.14

High-resolution mass spectrometry (ESI/FIA/HR, ESI/FIA):

Empirical formula: C₃₉ H₄₂ N₆ O₅

[M+H]⁺ calculated: 675.3289

[M+H]⁺ measured: 675.3286

5 **Example 419.** *N*-(3-Cyanophenyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 41" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI+):

Empirical formula: C₄₁H₃₈FN₅O₄

[M+H]⁺ calculated: 684.2988

15 [M+H]⁺ measured: 684.2975

Example 420. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trideuterio-methyl)-1*H*-pyrazol-4-yl]-1*H*-pyrrole-3-carboxamide hydrochloride

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 25" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI/+):

Empirical formula: C₃₈D₃H₃₆FN₆O₄

25 [M+H]⁺ calculated: 666.3285

[M+H]⁺ measured: 666.3265

Example 421. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₁ H₄₁ F N₆ O₄

[M+H]⁺ calculated: 701.3246

[M+H]⁺ measured: 701.3282

Example 422. *N*-(4-Hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 25 and the compound of Preparation 3' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% theoretical; measured)

%C=67.00:67.47; %H=6.07:5.54; %N=12.34:12.46; %Cl=5.20:4.58

High-resolution mass spectrometry (ESI⁺/FIA/HR, ESI/FIA):

Empirical formula: C₃₈ H₄₀ N₆ O₄

[M+H]⁺ calculated: 645.3184

[M+H]⁺ measured: 645.3182

Example 423. 5-(5-Fluoro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-[1-(oxetan-3-yl)-1H-pyrazol-4-yl]-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 26" in Step C.

Elemental microanalysis: (% , theoretical:measured)

%C=68.17:67.82; %H=5.86:5.97; %N=11.92:11.48

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₀H₄₁FN₆O₅

[M+H]⁺ calculated: 705.3202

[M+H]⁺ measured: 705.3207

Example 424. N-(4-Hydroxyphenyl)-N-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-5-(2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 25 and the compound of Preparation 3' in Step A, and the compound of Preparation 12" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=66.05:65.63; %H=5.83:5.45; %N=11.85:11.93; %Cl⁻=5.00:4.91

High-resolution mass spectrometry (ESI⁺-/FIA/HR, ESI-/FIA):

Empirical formula: C₃₉ H₄₀ N₆ O₅

[M+H]⁺ calculated: 673.3133

[M+H]⁺ measured: 673.3129

Example 425. *N*-(3-Cyano-5-methoxyphenyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.25:66.55; %H=5.51:5.28; %N=9.33:8.55 %Cl⁻=4.73:4.67

Example 426. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 12" in Step C.

High-resolution mass spectrometry (ESI/FLA/HR and MS/MS):

Empirical formula: C₃₉H₃₉FN₆O₅

[M+H]⁺ calculated: 691.3038

[M+H]⁺ measured: 691.3060

Example 427. *N*-(3-Cyano-4-methoxyphenyl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.24:66.41; %H=5.51:5.35; %N=9.33:8.97 %Cl⁻=4.73:4.81

Example 428. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(4-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 26 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=66.79:66.97; %H=5.74:5.36; %N=11.40:11.45; %Cl⁻=4.81:4.53

High-resolution mass spectrometry (ESI⁺-/FIA/HR, ESI-/FIA):

Empirical formula: C₄₁ H₄₁ F N₆ O₄

[M+H]⁺ calculated: 701.3246

[M+H]⁺ measured: 701.3245

Example 429. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(4-fluoro-5-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 27 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.75:65.43; %H=5.78:5.57; %N=10.95:10.81; %Cl⁻=4.62:4.54

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI/FIA):

Empirical formula: C₄₂ H₄₃ F N₆ O₅

[M+H]⁺ calculated: 731.3352

[M+H]⁺ measured: 731.3351

5 **Example 430.** 5-(5-Chloro-2-{{3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1H)-yl}-carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrrolo[2,3-b]-pyridin-5-yl)-1H-pyrrole-3-carboxamide

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and racemic 3-(trifluoromethyl)-1,2,3,4-tetrahydroisoquinoline in Step A, and the compound of Preparation 11" in Step C.

High-resolution mass spectrometry (ESI+/-FIA/HR and MS/MS, ESI/FIA):

Empirical formula: C₃₈ H₃₁ Cl F₃ N₅ O₃

[M+H]⁺ calculated: 698.2140

[M+H]⁺ measured: 698.2144

15 **Example 431.** 5-(5-Chloro-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(1,3-dimethyl-1H-pyrazol-4-yl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical;measured)

%C=64.19:64.37; %H=5.80:5.18; %N=11.52:11.55; %Cl=4.86:4.68

20 ***High-resolution mass spectrometry (ESI+/-FIA/HR, ESI/FIA):***

Empirical formula: C₃₉ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 693.2951

[M+H]⁺ measured: 693.2952

and

Example 432. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(1,5-dimethyl-1*H*-pyrazol-4-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

5 %C=64.19:64.43; %H=5.80:5.22; %N=11.52:11.60; %Cl⁻=4.86:4.66

High-resolution mass spectrometry (ESI⁺/FLA/HR, ESI⁻/FLA):

Empirical formula: C₃₉ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 693.2951

[M+H]⁺ measured: 693.2953

10 The compounds of Examples 431 and 432 are obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the mixture of Preparation 27'' in Step C. At the end of Step D, the isomers are separated by preparative HPLC using acetonitrile and water-TFA as eluants. After evaporating off the solvent and neutralising with sodium bicarbonate, the products are
15 subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the title products are obtained.

Example 433. *N*-(5-Cyano-1-methyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-1*H*-pyrrole-3-carboxamide hydrochloride

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 25 and the compound of Preparation 3' in Step A, and the compound of Preparation 19'' in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 *Elemental microanalysis: (% , theoretical:measured)*

%C=68.12:68.29; %H=5.86:5.40; %N=11.92:12.05; %Cl⁻=5.03:4.92

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS):

Empirical formula: C₄₀ H₄₀ N₆ O₄

[M+H]⁺ calculated: 669.3184

[M+H]⁺ measured: 669.3184

5 **Example 434. 5-(5-Fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process described in Step B of Example 49 using Example 385 as starting material. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.15:68.03; %H=5.90:5.50; %N=11.19:10.59 %Cl=4.72:5.55

15 **Example 435. *N*-(4-Cyanopyridin-2-yl)-5-(5-fluoro-4-methoxy-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride**

20 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 14 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI⁺/FIA/HR, ESI⁻/FIA):

Empirical formula: C₄₁ H₃₉ F N₆ O₅

[M+H]⁺ calculated: 715.3039

[M+H]⁺ measured: 715.3040

Example 436. 5-(5-Chloro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyanothiophen-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=63.07:63.09; %H=5.02:4.78; %N=9.43:9.35; %S=4.32:4.09; %Cl=4.77:4.59

High-resolution mass spectrometry (ESI/FLA/HR and MS/MS, ESI⁺/FLA):

Empirical formula: C₃₉ H₃₆ Cl N₅ O₄ S

[M+H]⁺ calculated: 706.2249;

[M+H]⁺ measured: 706.2250

Example 437. *N*-(3-Cyano-4-fluorophenyl)-5-(5-fluoro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ES⁺):

Empirical formula: C₄₁H₃₇F₂N₅O₄

[M+H]⁺ calculated: 702.2894

[M+H]⁺ measured: 702.2886

Example 438. 5-(5-Chloro-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyrazin-2-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=63.95:63.96; %H=5.37:5.17; %N=11.78:11.61; %Cl=4.97:4.57

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₈ H₃₇ Cl N₆ O₄

[M+H]⁺ calculated: 677.2638

[M+H]⁺ measured: 677.2639

Example 439. 5-(5-Fluoro-4-methoxy-2-([(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-*N*-(2-methoxypyrimidin-5-yl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 14 and the compound of Preparation 3' in Step A, and the compound of Preparation 12" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

High-resolution mass spectrometry (ESI/FIA/HR and MS/MS, ESI-/FIA):

Empirical formula: C₄₀ H₄₁ F N₆ O₆

[M+H]⁺ calculated: 721.3144

[M+H]⁺ measured: 721.3144

Example 440. *N*-(5-Cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-4-methoxy-2-
{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-
N-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid
of Preparation 14 and the compound of Preparation 3' in Step A, and the compound of
Preparation 18" in Step C. The compound obtained is converted into salt form and
lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.75:65.98; %H=5.78:5.50; %N=10.95:10.87; %Cl=4.62:4.42

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₂ H₄₃ F N₆ O₅

[M+H]⁺ calculated: 731.3352

[M+H]⁺ measured: 731.3353

Example 441. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-
2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-1,2-dimethyl-*N*-
phenyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid
of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of
Preparation 29" in Step C, it being understood that Step D is not carried out. The
compound obtained is converted into salt form and lyophilised as described in the general
process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=66.75:66.44; %H=5.74:5.59; %N=11.39:11.45; %Cl=4.81:4.43

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₁ H₄₁ Cl N₆ O₃

[M+H]⁺ calculated: 701.3001

[M+H]⁺ measured: 701.2998

Example 442. 5-(5-Chloro-2-[[[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-N-(5-cyanothiophen-3-yl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 42" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=63.07:63.14; %H=5.02:4.87; %N=9.43:9.41; %S=4.32:4.24; %Cl⁻=4.77:4.57

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₉ H₃₆ Cl N₅ O₄ S

[M+H]⁺ calculated: 706.2249

[M+H]⁺ measured: 706.2252

Example 443. 5-(5-Fluoro-4-hydroxy-2-[[[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl)-N-phenyl-1H-pyrrole-3-carboxamide

Step A: 5-(5-Fluoro-4-methoxy-2-[[[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl)-N-phenyl-1H-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 (Steps A to C) using the acid of Preparation 28 and the compound from Preparation 3' in Step A, and the compound of Preparation 30" in Step C.

Step B: 5-(5-Fluoro-4-hydroxy-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl)-N-phenyl-1H-pyrrole-3-carboxamide

To a solution of the compound of Step A (1 g; 1.37 mmol) in anhydrous dichloromethane (10 mL) there is added, dropwise at 0°C, a 1M solution of boron tribromide in dichloromethane (1.8 mL; 1.8 mmol). After stirring for 15 hours at ambient temperature, the reaction mixture is poured dropwise into a solution of ethanol (15 mL) at -10°C. After stirring for one hour, saturated aqueous sodium bicarbonate solution is added, and the reaction mixture is extracted with dichloromethane. After drying over MgSO₄, the residue is purified on a silica gel column using a mixture of dichloromethane and methanol as eluant to yield the expected product.

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₂ H₄₁ F N₆ O₄

[M+H]⁺ calculated: 713.3246

[M+H]⁺ measured: 713.3244

Example 444. 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-N-(5-methoxypyrazin-2-yl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=62.99:62.72; %H=5.42:5.24; %N=11.30:11.19; %Cl=4.77:4.67

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₉ H₃₉ Cl N₆ O₅

[M+H]⁺ calculated: 707.2743

[M+H]⁺ measured: 707.2747

Example 445. 5-(5-Chloro-2-[[*(3S)*-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trideuteriomethyl)-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl]-1*H*-pyrrole-3-carboxamide hydrochloride

5 **Step A:** 5-(5-Chloro-2-[[*(3S)*-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trideuteriomethyl)-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl]-1*H*-pyrrole-3-carboxamide

The intermediate is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of
10 Preparation 31" in Step C.

Step B: 5-(5-Chloro-2-[[*(3S)*-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-[1-(trideuteriomethyl)-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl]-1*H*-pyrrole-3-carboxamide hydrochloride

The procedure is in accordance with the protocol described in Step B of Example 49, it
15 being understood that the product is then subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the title product is obtained.

Elemental microanalysis: (% , theoretical:measured)

%C=65.45:65.33; %H=5.78:5.59; %N=10.90:10.82; %Cl=4.60:4.28

20 **High-resolution mass spectrometry (ESI+/HR, ESI-/LR):**

Empirical formula: C₄₂ H₄₀ Cl D₃ N₆ O₄

[M+H]⁺ calculated: 734.3295

[M+H]⁺ measured: 734.3300

Example 446. 5-(5-Chloro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(5-fluoropyrazin-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% theoretical:measured)

%C=62.28:62.16; %H=5.10:4.97; %N=11.04:11.35; %Cl=4.85:4.48

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₈ H₃₆ Cl F N₆ O₄

[M+H]⁺ calculated: 695.2543

[M+H]⁺ measured: 695.2545

Example 447. 5-(4-Fluoro-2-{{(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl}carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 26 and the compound of Preparation 3' in Step A, and the compound of Preparation 1'' in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% theoretical:measured)

%C=65.28:65.27; %H=5.77:5.51; %N=12.02:1.90; %Cl=5.07:4.74

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₈ H₃₉ F N₆ O₄

[M+H]⁺ calculated: 663.3090

[M+H]⁺ measured: 663.3084

Example 448. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[5-cyano-1-(trideuteriomethyl)-1*H*-pyrrol-3-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 32" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.69:64.23; %H=5.45:5.47; %N=11.32:11.16; %Cl=4.77:4.56

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₀ H₃₆ Cl D₃ N₆ O₄

[M+H]⁺ calculated: 706.2982

[M+H]⁺ measured: 706.2985

Example 449. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-[5-cyano-2-methyl-1-(trideuteriomethyl)-1*H*-pyrrol-3-yl]-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 33" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.07:64.55; %H=5.62:5.51; %N=11.11:10.98; %Cl=4.68:4.58

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₁ H₃₈ Cl D₃ N₆ O₄

[M+H]⁺ calculated: 720.3139

[M+H]⁺ measured: 720.3143

Example 450. 5-(5-Chloro-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(3-cyano-1-methyl-1H-pyrazol-5-yl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 34" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=63.24:62.62; %H=5.31:5.09; %N=13.24:13.04; %Cl=4.79:4.37

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₉ H₃₈ Cl N₇ O₄

[M+H]⁺ calculated: 704.2747

[M+H]⁺ measured: 704.2747

Example 451. 5-(5-Fluoro-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-(1-methyl-1H-pyrazolo[3,4-b]pyridin-5-yl)-1H-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 17" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.64:66.28; %H=5.51:5.45; %N=13.07:12.17 %Cl=4.73:5.51

Example 452. N-(1,3-Dimethyl-1H-pyrazol-4-yl)-5-(5-fluoro-2-{{(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl}carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.68:64.77; %H=5.94:5.55; %N=11.78:10.69 %Cl=4.97:6.48

and

Example 453. *N*-(1,5-Dimethyl-1*H*-pyrazol-4-yl)-5-(5-fluoro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

Elemental microanalysis: (% , theoretical:measured)

%C=65.68:65.43; %H=5.94:5.62; %N=11.78:10.95 %Cl=4.97:5.60

The compounds of Examples 452 and 453 are obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the mixture of Preparation 27" in Step C. At the end of Step D, the isomers are separated by preparative HPLC using acetonitrile and water-TFA as eluants. After evaporating off the solvent and neutralising with sodium bicarbonate, the products are subjected to a step of conversion into salt form in the presence of 1M HCl in ether. After filtration and lyophilisation in a mixture of acetonitrile/water, the title products are obtained.

Example 454. 5-(5-Chloro-2-[[3-(trifluoromethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid from Preparation 1 and racemic 3-(trifluoromethyl)-1,2,3,4-tetrahydroisoquinoline in Step A, and the compound of Preparation 18" in Step C.

Elemental microanalysis: (% , theoretical:measured)

%C=64.77:64.81; %H=4.55:4.52; %N=10.21:10.33

High-resolution mass spectrometry (ESI+/HR):

Empirical formula: C₃₇ H₃₁ Cl F₃ N₅ O₃

[M+H]⁺ calculated: 686.2140

[M+H]⁺ measured: 686.2145

5 **Example 455. 5-(5-Chloro-2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl}phenyl)-N-{5-cyano-2-methyl-1-[2-(morpholin-4-yl)ethyl]-1H-pyrrol-3-yl}-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 1' in Step A, and the compound of Preparation 35" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.71:66.07; %H=5.78:5.82; %N=10.95:10.66; %Cl=4.62:4.45

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

15 Empirical formula: C₄₂ H₄₃ Cl N₆ O₄

[M+H]⁺ calculated: 731.3107

[M+H]⁺ measured: 731.3109

20 **Example 456. 5-(5-Chloro-2-{[(3R)-3-methyl-3,4-dihydroisoquinolin-2(1H)-yl]-carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-{2-[2-(morpholin-4-yl)-ethoxy]pyrimidin-5-yl}-1H-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 1' in Step A, and the compound of Preparation 36" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 ***Elemental microanalysis: (% , theoretical:measured)***

%C=63.41:63.51; %H=5.59:5.26; %N=11.09:11.10; %Cl=4.68:4.46

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₀ H₄₁ Cl N₆ O₅

[M+H]⁺ calculated: 721.2900

[M+H]⁺ measured: 721.2907

5 **Example 457. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(6-cyano-5-methoxypyridin-2-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=64.15:63.95; %H=5.25:4.79; %N=10.95:10.97; %Cl=4.62:4.22

High-resolution mass spectrometry (ESI+/HR):

15 Empirical formula: C₄₁ H₃₉ Cl N₆ O₅

[M+H]⁺ calculated: 731.2743

[M+H]⁺ measured: 731.2746

20 **Example 458. 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,4-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 37" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 **Elemental microanalysis: (% , theoretical:measured)**

%C=65.34:65.68; %H=5.62:5.31; %N=11.15:11.15; %Cl=4.70:4.33

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₁ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 717.2951

[M+H]⁺ measured: 717.2954

5 **Example 459. 5-(5-Chloro-2-{[(3S)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(5-cyano-1-ethyl-2-methyl-1H-pyrrol-3-yl)-N-(4-hydroxyphenyl)-1,2-dimethyl-1H-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 38" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.71;65.29; %H=5.78;5.51; %N=10.95;10.95; %Cl=4.62;4.39

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

15 Empirical formula: C₄₂ H₄₃ Cl N₆ O₄

[M+H]⁺ calculated: 731.3107

[M+H]⁺ measured: 731.3109

20 **Example 460. 5-(5-Chloro-2-{[(3R)-3-[3-(morpholin-4-yl)propyl]-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl}phenyl)-N-(4-hydroxyphenyl)-1,2-dimethyl-N-[1-(tetrahydrofuran-3-yl)-1H-pyrazol-4-yl]-1H-pyrrole-3-carboxamide hydrochloride**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 6' in Step A, and the compound of Preparation 22" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

25 ***Elemental microanalysis: (% , theoretical:measured)***

%C=64.58;64.24; %H=6.05;5.88; %N=10.51;10.53; %Cl=4.43;4.39

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₄₃ H₄₇ Cl N₆ O₅

[M+H]⁺ calculated: 763.3369

[M+H]⁺ measured: 763.3371

5 **Example 461. 5-(5-Chloro-2-[(3*R*)-3-[3-(morpholin-4-yl)propyl]-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide hydrochloride**

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 6' in Step A, and the compound of Preparation 29" in Step C, it being understood that Step D is not carried out. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=67.44:66.68; %H=6.05:5.80; %N=10.97:10.95; %Cl⁻=4.63:4.57

15 ***High-resolution mass spectrometry (ESI+/HR):***

Empirical formula: C₄₃ H₄₅ Cl N₆ O₃

[M+H]⁺ calculated: 729.3314

[M+H]⁺ measured: 729.3316

20 **Example 462. 5-(5-Chloro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(5-methyl-1,2-oxazol-3-yl)-1*H*-pyrrole-3-carboxamide**

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the appropriate amine in Step C.

25 ***Elemental microanalysis: (% , theoretical:measured)***

%C=67.10:66.64; %H=5.63:5.40; %N=10.30:10.24

High-resolution mass spectrometry (ESI+/HR, ESI-/LR):

Empirical formula: C₃₈ H₃₈ Cl N₅ O₅

[M+H]⁺ calculated: 680.2634

[M+H]⁺ measured: 680.2637

5 **Example 463.** *N*-(2-Ethoxypyrimidin-5-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide

10 The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 8 and the compound of Preparation 3' in Step A, and the compound of Preparation 39" in Step C.

Elemental microanalysis: (% , theoretical:measured)

%C=68.17:67.52; %H=5.86:5.60; %N=11.92:11.43

15 **Example 464.** 5-(5-Chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(5-hydroxypyridin-2-yl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide dihydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and the compound of Preparation 3' in Step A, and the compound of Preparation 40" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

20 **High-resolution mass spectrometry (ESI+/HR, ESI-/LR):**

Empirical formula: C₄₁ H₄₀ Cl N₇ O₄

[M+H]⁺ calculated: 730.2903

[M+H]⁺ measured: 730.2907

Example 465. 5-(4-Chloro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 29 and the compound of Preparation 3' in Step A, and the compound of Preparation 18" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=65.34:64.81; %H=5.62:5.27; %N=11.15:10.95 %Cl⁻=4.70:5.09

High-resolution mass spectrometry (ESI⁺):

Empirical formula: C₄₁ H₄₁ Cl N₆ O₄

[M+H]⁺ calculated: 717.2951

[M+H]⁺ measured: 717.2952

Example 466. 5-(4-Chloro-2-[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl]phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide hydrochloride

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 29 and the compound of Preparation 3' in Step A, and the compound of Preparation 1" in Step C. The compound obtained is converted into salt form and lyophilised as described in the general process to obtain the title compound.

Elemental microanalysis: (% , theoretical:measured)

%C=66.77:62.82; %H=5.63:5.29; %N=11.74:11.75; %Cl⁻=5.01:5.23

High-resolution mass spectrometry (ESI⁺/HR, ESI⁻/LR):

Empirical formula: C₃₈ H₃₉ Cl N₆ O₄

[M+H]⁺ calculated: 679.2794

[M+H]⁺ measured: 679.2796

Example 467. 5-(5-Chloro-2-{{[3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-phenyl-1*H*-pyrrole-3-carboxamide

The title compound is obtained in accordance with the process of Example 1 using the acid of Preparation 1 and 1,2,3,4-tetrahydroisoquinoline in Step A, and the compound of Preparation 2" in Step C.

Elemental microanalysis: (% , theoretical:measured)

%C=72.97;72.93; %H=5.25;5.08; %N=7.29;7.34

High-resolution mass spectrometry (ESI/FLA/HR and MS/MS):

Empirical formula: C₃₅ H₃₀ Cl N₃ O₃

[M+H]⁺ calculated: 576.2048

[M+H]⁺ measured: 576.2067

PHARMACOLOGICAL STUDY

EXAMPLE A: Inhibition of Bcl-2 by the fluorescence polarisation technique

The fluorescence polarisation tests were carried out on microplates (384 wells). The Bcl-2 protein, labelled (histag-Bcl-2 such that Bcl-2 corresponds to the UniProtKB[®] primary
5 accession number: P10415), at a final concentration of 2.50×10^{-8} M, is mixed with a
fluorescent peptide (Fluorescein-REIGAQLRRMADDLNAQY), at a final concentration of
 1.00×10^{-8} M in a buffer solution (Hepes 10 mM, NaCl 150 mM, Tween20 0.05%, pH 7.4),
in the presence or absence of increasing concentrations of test compounds. After
incubation for 2 hours, the fluorescence polarisation is measured.

10 The results are expressed in IC₅₀ (the concentration of compound that inhibits fluorescence
polarisation by 50 %) and are presented in Table 1 below.

The results show that the compounds of the invention inhibit interaction between the Bcl-2
protein and the fluorescent peptide described hereinbefore.

EXAMPLE B: *In vitro* cytotoxicity

15 The cytotoxicity studies were carried out on the RS4;11 leukaemia tumour line.

The cells are distributed onto microplates and exposed to the test compounds for 48 hours.
The cell viability is then quantified by a colorimetric assay, the Microculture Tetrazolium
Assay (Cancer Res., 1987, 47, 939-942).

The results are expressed in IC₅₀ (the concentration of compound that inhibits cell viability
20 by 50 %) and are presented in Table 1 below.

The results show that the compounds of the invention are cytotoxic.

**Table 1: IC₅₀ of Bcl-2 inhibition (fluorescence polarisation test)
and of cytotoxicity for RS4;11 cells**

	IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11		IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11
Example 1	5.0	33.6	Example 29	6.6	47.5
Example 2	ND	1660	Example 30	4.7	771
Example 3	24.6	94.9	Example 31	7.2	89.3
Example 4	ND	231	Example 32	13.3	240
Example 5	21.2	44.8	Example 33	10.9	57.8
Example 6	25.2	69	Example 34	8.2	47
Example 7	25.6	90.6	Example 35	50.0	560
Example 8	ND	255	Example 36	71.4	>600
Example 9	22.4	87.5	Example 37	60.4	>600
Example 10	16.2	205	Example 38	7.5	134
Example 11	14.2	202	Example 39	7.2	19.7
Example 12	5.5	39.6	Example 40	64.4	431
Example 13	4.4	19.8	Example 41	10.0	22.6
Example 14	3.7	8.23	Example 42	5.2	4.36
Example 15	11.1	69.4	Example 43	5.1	28.9
Example 16	12.6	22.7	Example 44	3.0	5.41
Example 17	8.0	75.2	Example 45	38.9	403
Example 18	3.9	27.6	Example 46	76.6	>600
Example 19	6.0	65.5	Example 47	5.9	44.5
Example 20	4.9	164	Example 48	4.4	14.9
Example 21	4.7	79.9	Example 49	4.0	14.1
Example 22	6.6	45.7	Example 50	5.9	33.1
Example 23	3.6	25.4	Example 51	26.7	354
Example 24	6.2	79.1	Example 52	28.9	433
Example 25	4.0	33.3	Example 53	43.5	293
Example 26	4.1	541	Example 54	18.0	30.5
Example 27	5.2	93.4	Example 55	209.6	>600
Example 28	7.5	95.3	Example 56	75.0	>600

	IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11		IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11
Example 57	80.0	>600	Example 102	2	6.51
Example 58	133.3	>600	Example 108	3.9	15.4
Example 59	134.0	>600	Example 109	91.5	930
Example 60	ND	18.3	Example 110	8.5	39.5
Example 61	4.5	37.8	Example 115	3.6	18.3
Example 62	14.3	127	Example 116	3.4	47.8
Example 63	5.1	11.2	Example 122	3.4	82.4
Example 65	21.9	113	Example 126	4.2	49.2
Example 66	16.9	241	Example 127	5.3	111
Example 67	12.5	98.6	Example 129	18.1	275
Example 68	2.1	20.7	Example 207	4.6	32.2
Example 69	5.3	3.68	Example 209	7.4	25.4
Example 70	8.5	63.5	Example 210	8.8	47.2
Example 71	6.1	12.9	Example 214	6.3	236
Example 72	7.7	43.6	Example 230	5.1	18.3
Example 73	8	42.6	Example 358	14.8	165
Example 74	4	45.4	Example 384	9.7	216
Example 75	52.9	367	Example 385	5.7	28.7
Example 81	ND	249	Example 386	2.6	9.23
Example 82	19.5	427	Example 387	20.6	243
Example 88	15.9	69.6	Example 388	3.6	16.5
Example 92	8.4	37.8	Example 389	14.7	208
Example 93	19.7	368	Example 390	21.2	173
Example 94	8.6	104	Example 391	30.3	255
Example 95	7	174	Example 392	3.8	11.4
Example 96	13.5	161	Example 393	2.1	1.95
Example 97	19	98	Example 394	2.5	2.76
Example 98	7.6	68.3	Example 395	3.5	7.57
Example 99	6.4	108	Example 396	15.7	116
Example 100	22.9	193	Example 397	4.5	37.1
Example 101	21.1	743	Example 398	3.9	13.4

	IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11		IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11
Example 399	9.9	155	Example 432	3.4	76.6
Example 400	49	469	Example 433	2.6	48.2
Example 401	8	24.3	Example 434	3.5	45.7
Example 402	26.1	241	Example 435	14.9	441
Example 403	24.2	289	Example 436	49.1	338
Example 404	24.4	85.5	Example 437	4.4	70.5
Example 406	4.2	10.6	Example 438	11.3	379
Example 407	20.6	150	Example 439	6.1	329
Example 408	5.4	4.46	Example 440	2.6	13.6
Example 409	12.2	41.9	Example 441	3.5	132
Example 410	9.9	61.6	Example 442	3	42.8
Example 411	5.5	32.8	Example 443	ND	57.9
Example 412	3.1	0.398	Example 444	5.5	181
Example 413	3.1	9.43	Example 445	2	19
Example 415	3.8	29.9	Example 446	7.8	249
Example 416	2.9	42.5	Example 447	20	>600
Example 417	3	11	Example 448	2.4	12.1
Example 418	10.1	159	Example 449	1.7	11.9
Example 419	2.8	15.8	Example 450	2.7	53.2
Example 420	6.1	51.8	Example 451	2.9	102
Example 421	2.5	3.73	Example 452	8.3	112
Example 422	9.2	101	Example 453	6.9	99.9
Example 423	11.7	344	Example 454	6.5	158
Example 424	13.6	102	Example 455	1.9	11.8
Example 425	4.2	62	Example 456	2.7	80.6
Example 426	5.2	139	Example 457	ND	80.4
Example 427	2.2	23.3	Example 458	10.5	197
Example 428	3.5	59.2	Example 459	2.5	5.93
Example 429	3.1	109	Example 460	2.8	22.9
Example 430	19.9	328	Example 461	3.1	18.6
Example 431	3	89	Example 462	13.3	368

	IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11		IC ₅₀ (nM) Bcl-2 FP	IC ₅₀ (nM) MTT RS4;11
Example 463	ND	40.8	Example 466	ND	493
Example 464	36.6	723	Example 467	19.2	188
Example 465	ND	50.6			

ND: not determined

EXAMPLE C: Induction of caspase activity *in vivo*.

The ability of the compounds of the invention to activate caspase 3 is evaluated in a xenograft model of RS4;11 leukaemia cells.

5 1x10⁷ RS4;11 cells are grafted sub-cutaneously into immunosuppressed mice (SCID strain). 25 to 30 days after the graft, the animals are treated orally with the various compounds. Sixteen hours after treatment, the tumour masses are recovered and lysed, and the caspase 3 activity is measured in the tumour lysates.

10 This enzymatic measurement is carried out by assaying the appearance of a fluorogenic cleavage product (DEVDase activity, Promega). It is expressed in the form of an activation factor corresponding to the ratio between the two caspase activities: the activity for the treated mice divided by the activity for the control mice.

The results obtained show that the compounds of the invention are capable of inducing apoptosis in RS4;11 tumour cells *in vivo*.

15 **EXAMPLE D: Quantification of the cleaved form of caspase 3 *in vivo*.**

The ability of the compounds of the invention to activate caspase 3 is evaluated in a xenograft model of RS4;11 leukaemia cells.

20 1x10⁷ RS4;11 cells are grafted sub-cutaneously into immunosuppressed mice (SCID strain). 25 to 30 days after the graft, the animals are treated orally with the various compounds. After treatment, the tumour masses are recovered and lysed, and the cleaved (activated) form of caspase 3 is quantified in the tumour lysates.

The quantification is carried out using the "Meso Scale Discovery (MSD) ELISA platform" test, which specifically assays the cleaved form of caspase 3. It is expressed in

the form of an activation factor corresponding to the ratio between the quantity of cleaved caspase 3 in the treated mice divided by the quantity of cleaved caspase 3 in the control mice.

The results show that the compounds of the invention are capable of inducing apoptosis in RS4;11 tumour cells *in vivo*.

Table 2: Caspase activation factors (cleaved caspase 3 MSD test in the tumours of treated mice versus control mice) *in vivo*, after treatment by the oral route (exact doses in brackets)

Compound tested	Time period after which the tumour is removed (T)	Activation factor $\pm$ SEM (versus control)
Example 25	2 hours	45.7 ± 2.0 (25 mg/kg)
Example 28	2 hours	72.3 ± 5.4 (12.5 mg/kg)
Example 47	2 hours	12.3 ± 2.4 (25 mg/kg)
Example 61	2 hours	76.0 ± 5.2 (12.5 mg/kg)
Example 67	2 hours	29.8 ± 4.0 (25 mg/kg)
Example 71	2 hours	46.8 ± 16.1 (25 mg/kg)
Example 74	2 hours	24.5 ± 7.4 (12.5 mg/kg)
Example 108	2 hours	22.6 ± 2.4 (12.5 mg/kg)
Example 230	2 hours	42.2 ± 9.3 (25 mg/kg)
Example 386	2 hours	52.0 ± 8.6 (12.5 mg/kg)
Example 388	2 hours	85.7 ± 3.7 (25 mg/kg)
Example 421	2 hours	38.7 ± 10.7 (12.5 mg/kg)
Example 449	2 hours	50.5 ± 3.4 (12.5 mg/kg)

EXAMPLE E: Anti-tumour activity *in vivo*

The anti-tumour activity of the compounds of the invention is evaluated in a xenograft model of RS4;11 leukaemia cells.

1×10^7 RS4;11 cells are grafted sub-cutaneously into immunosuppressed mice (SCID strain). 25 to 30 days after the graft, when the tumour mass has reached about 150 mm^3 , the mice are treated orally with the various compounds in two different regimes (daily treatment for five days per week for two weeks, or two treatments weekly for two weeks).

5 The tumour mass is measured twice weekly from the start of treatment.

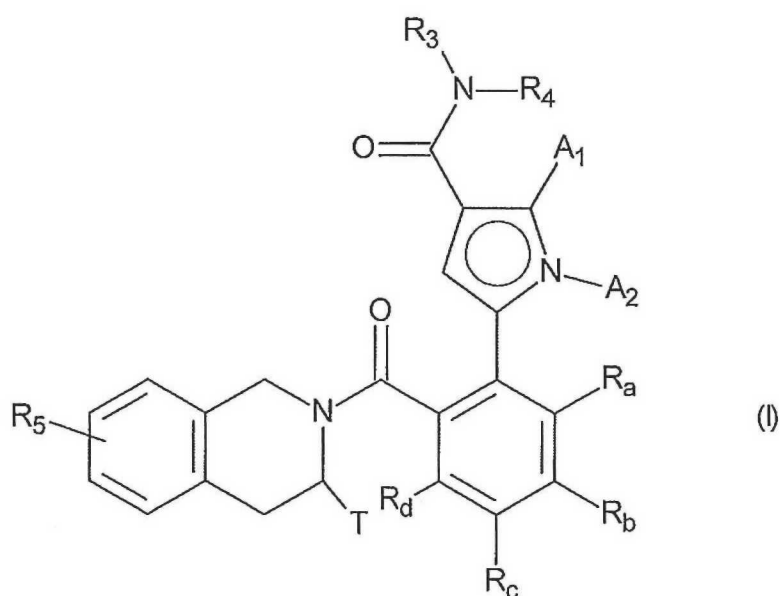
The results obtained accordingly show that the compounds of the invention are capable of inducing significant tumour regression, which can be total, during the treatment period.

EXAMPLE F: Pharmaceutical composition: Tablets

	1000 tablets containing a dose of 5 mg of a compound selected from Examples 1 to 467	5 g
10	Wheat starch.....	20 g
	Maize starch	20 g
	Lactose	30 g
	Magnesium stearate.....	2 g
	Silica.....	1 g
15	Hydroxypropylcellulose	2 g

CLAIMS

1. Compound of formula (I):



wherein:

- 5 ♦ A_1 and A_2 , each independently of the other, represent a hydrogen or halogen atom, a linear or branched (C_1-C_6) polyhaloalkyl group, a linear or branched (C_1-C_6) alkyl group or a cycloalkyl group,
- 10 ♦ T represents a hydrogen atom, a linear or branched (C_1-C_6) alkyl group optionally substituted by from one to three halogen atoms, a group (C_1-C_4) alkyl- NR_1R_2 , or a group (C_1-C_4) alkyl- OR_6 ,
- 15 ♦ R_1 and R_2 , each independently of the other, represent a hydrogen atom or a linear or branched (C_1-C_6) alkyl group, or R_1 and R_2 form with the nitrogen atom carrying them a heterocycloalkyl,
- ♦ R_3 represents a linear or branched (C_1-C_6) alkyl group, a linear or branched (C_2-C_6) alkenyl group, a linear or branched (C_2-C_6) alkynyl group, a cycloalkyl group, a (C_3-C_{10}) cycloalkyl- (C_1-C_6) alkyl group wherein the alkyl moiety is linear or branched, a heterocycloalkyl group, an aryl group or a heteroaryl group, it being

understood that one or more of the carbon atoms of the preceding groups, or of their possible substituents, may be deuterated,

♦ R_4 represents an aryl group, a heteroaryl group, a cycloalkyl group or a linear or branched (C_1 - C_6)alkyl group, it being understood that one or more of the carbon atoms of the preceding groups, or of their possible substituents, may be deuterated,

♦ R_5 represents a hydrogen or halogen atom, a linear or branched (C_1 - C_6)alkyl group, or a linear or branched (C_1 - C_6)alkoxy group,

♦ R_6 represents a hydrogen atom or a linear or branched (C_1 - C_6)alkyl group,

♦ R_a , R_b , R_c and R_d , each independently of the others, represent R_7 , a halogen atom, a linear or branched (C_1 - C_6)alkoxy group, a hydroxy group, a linear or branched (C_1 - C_6)polyhaloalkyl group, a trifluoromethoxy group, $-NR_7R_7'$, nitro, R_7 -CO- $(C_0$ - C_6)alkyl-, R_7 -CO-NH- $(C_0$ - C_6)alkyl-, NR_7R_7' -CO- $(C_0$ - C_6)alkyl-, NR_7R_7' -CO- $(C_0$ - C_6)alkyl-O-, R_7 -SO₂-NH- $(C_0$ - C_6)alkyl-, R_7 -NH-CO-NH- $(C_0$ - C_6)alkyl-, R_7 -O-CO-NH- $(C_0$ - C_6)alkyl-, a heterocycloalkyl group, or the substituents of one of the pairs (R_a , R_b), (R_b , R_c) or (R_c , R_d) form together with the carbon atoms carrying them a ring composed of from 5 to 7 ring members, which may contain from one to 2 hetero atoms selected from oxygen and sulphur, it also being understood that one or more carbon atoms of the ring defined hereinbefore may be deuterated or substituted by from one to 3 groups selected from halogen and linear or branched (C_1 - C_6)alkyl,

♦ R_7 and R_7' , each independently of the other, represent a hydrogen, a linear or branched (C_1 - C_6)alkyl, a linear or branched (C_2 - C_6)alkenyl, a linear or branched (C_2 - C_6)alkynyl, an aryl or a heteroaryl, or R_7 and R_7' , together with the nitrogen atom carrying them, form a heterocycle composed of from 5 to 7 ring members,

it being understood that:

- "aryl" means a phenyl, naphthyl, biphenyl or indenyl group,
- "heteroaryl" means any mono- or bi-cyclic group composed of from 5 to 10 ring members, having at least one aromatic moiety and containing from 1 to 4 hetero atoms selected from oxygen, sulphur and nitrogen (including quaternary nitrogens),
- "cycloalkyl" means any mono- or bi-cyclic, non-aromatic, carbocyclic group containing from 3 to 10 ring members,

- "heterocycloalkyl" means any mono- or bi-cyclic, non-aromatic, condensed or spiro group composed of from 3 to 10 ring members and containing from 1 to 3 hetero atoms selected from oxygen, sulphur, SO, SO₂ and nitrogen,

it being possible for the aryl, heteroaryl, cycloalkyl and heterocycloalkyl groups so defined
5 and the groups alkyl, alkenyl, alkynyl and alkoxy to be substituted by from 1 to 3 groups selected from optionally substituted, linear or branched (C₁-C₆)alkyl, (C₃-C₆)spiro, optionally substituted, linear or branched (C₁-C₆)alkoxy, (C₁-C₆)alkyl-S-, hydroxy, oxo (or *N*-oxide where appropriate), nitro, cyano, -COOR', -OCOR', NR'R'', linear or branched (C₁-C₆)polyhaloalkyl, trifluoromethoxy, (C₁-C₆)alkylsulphonyl, halogen, optionally
10 substituted aryl, heteroaryl, aryloxy, arylthio, cycloalkyl, heterocycloalkyl optionally substituted by one or more halogen atoms or alkyl groups, it being understood that R' and R'', each independently of the other, represent a hydrogen atom or an optionally substituted, linear or branched (C₁-C₆)alkyl group,

its enantiomers and diastereoisomers, and addition salts thereof with a pharmaceutically
15 acceptable acid or base.

2. Compound of formula (I) according to claim 1, wherein A₁ represents a hydrogen atom or a methyl group.

3. Compound of formula (I) according to claim 1 or claim 2, wherein A₂ represents a linear or branched (C₁-C₆)alkyl group optionally substituted by a group selected from
20 halogen, hydroxy, linear or branched (C₁-C₆)alkoxy, NR'R'' and morpholine.

4. Compound of formula (I) according to claim 1 or claim 2, wherein A₂ represents a linear or branched (C₁-C₆)polyhaloalkyl group or a cyclopropyl group.

5. Compound of formula (I) according to one of claims 1 to 3, wherein A₁ and A₂ both represent a methyl group.

6. Compound of formula (I) according to one of claims 1 to 5, wherein T represents a methyl, aminomethyl, (morpholin-4-yl)methyl, (4-methylpipérazin-1-yl)methyl, 2-(morpholin-4-yl)ethyl, [2-(morpholin-4-yl)ethoxy]methyl, hydroxymethyl, [2-(dimethylamino)ethoxy]methyl, hexahydropyrazino[2,1-*c*][1,4]oxazin-8(1*H*)-ylmethyl, 1-oxa-6-azaspiro[3.3]hept-6-ylmethyl, 3-(morpholin-4-yl)propyl or trifluoromethyl group.

7. Compound of formula (I) according to one of claims 1 to 6, wherein R_a and R_d each represent a hydrogen atom and (R_b, R_c), together with the carbon atoms carrying them, form a 1,3-dioxolane group or a 1,4-dioxane group; or R_a, R_c and R_d each represent a hydrogen atom and R_b represents a hydrogen or halogen atom or a methoxy group.

8. Compound of formula (I) according to one of claims 1 to 6, wherein: R_a and R_d each represent a hydrogen atom, R_b represents a hydrogen or halogen atom and R_c represents a hydroxy or methoxy group; or: R_a and R_d each represent a hydrogen atom, R_b represents a hydroxy or methoxy group and R_c represents a halogen atom.

9. Compound of formula (I) according to one of claims 1 to 6, wherein R_a, R_b and R_d each represent a hydrogen atom and R_c represents a group selected from R₇-CO-NH-(C₀-C₆)alkyl-, R₇-SO₂-NH-(C₀-C₆)alkyl-, R₇-NH-CO-NH-(C₀-C₆)alkyl- and R₇-O-CO-NH-(C₀-C₆)alkyl-.

10. Compound of formula (I) according to one of claims 1 to 9, wherein R₄ represents a phenyl, 4-hydroxyphenyl, 3-fluoro-4-hydroxyphenyl, 2-hydroxypyrimidine or 3-hydroxypyridine group.

11. Compound of formula (I) according to one of claims 1 to 10, wherein R₃ represents an aryl or heteroaryl group.

12. Compound of formula (I) according to one of claims 1 to 10, wherein R₃ represents a group selected from methyl, phenyl, 1*H*-pyrazole, 1*H*-indole, 1*H*-indazole, pyridine, pyrimidine, 1*H*-pyrrolo[2,3-*b*]pyridine, 2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridine, 1*H*-benzimidazole, 1*H*-pyrrole, 1*H*-pyrrolo[2,3-*c*]pyridine, 1*H*-pyrrolo[3,2-*b*]pyridine, 5*H*-

pyrrolo[3,2-*d*]pyrimidine, thiophene, pyrazine, 1*H*-pyrazolo[3,4-*b*]pyridine, 1,2-oxazole, and 1*H*-pyrazolo[1,5-*a*]pyrimidine, those groups optionally having one or more substituents selected from halogen, linear or branched (C₁-C₆)alkyl, linear or branched (C₁-C₆)alkoxy, cyano, cyclopropyl, oxetane, tetrahydrofuran, -CO-O-CH₃,
5 trideuteriomethyl, 2-(morpholin-4-yl)ethyl and 2-(morpholin-4-yl)ethoxy.

13. Compound of formula (I) according to claim 10, wherein R₃ represents a linear or branched (C₁-C₆)alkyl or a heteroaryl optionally substituted by a linear or branched (C₁-C₆)alkyl, and R₄ represents a 4-hydroxyphenyl group.

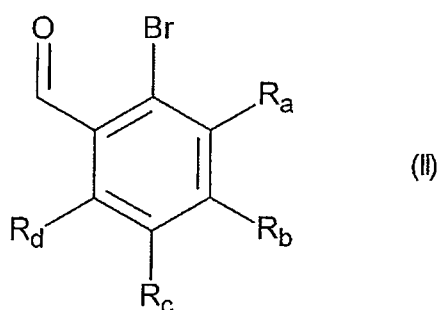
14. Compound of formula (I) according to claim 1, selected from the following group:

- 10 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide,
- 15 - *N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-5-(6-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-1*H*-pyrrole-3-carboxamide,
- *N*-(4-hydroxyphenyl)-1,2-dimethyl-5-(6-{[(3*R*)-3-methyl-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}-1,3-benzodioxol-5-yl)-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-
- 20 carboxamide,
- 5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrazol-4-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-1*H*-pyrrolo[2,3-
- 25 *b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(pyridin-4-yl)-1*H*-pyrrole-3-carboxamide,
- 30 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(5-cyano-1-methyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,

- *N*-(5-cyano-1-methyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-yl-methyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 5 - 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-*N*-(1-methyl-2,3-dihydro-1*H*-pyrrolo[2,3-*b*]pyridin-5-yl)-1*H*-pyrrole-3-carboxamide,
- 10 - *N*-(5-cyano-1,2-dimethyl-1*H*-pyrrol-3-yl)-5-(5-fluoro-2-{[(3*S*)-3-(morpholin-4-yl-methyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]carbonyl}phenyl)-*N*-(4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,
- 5-(5-chloro-2-{[(3*S*)-3-(morpholin-4-ylmethyl)-3,4-dihydroisoquinolin-2(1*H*)-yl]-carbonyl}phenyl)-*N*-[5-cyano-2-methyl-1-(trideuteriomethyl)-1*H*-pyrrol-3-yl]-*N*-
- 15 (4-hydroxyphenyl)-1,2-dimethyl-1*H*-pyrrole-3-carboxamide,

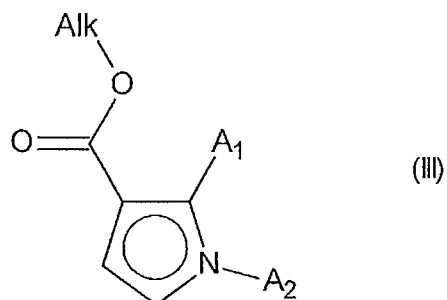
their enantiomers and diastereoisomers, and addition salts thereof with a pharmaceutically acceptable acid or base.

15. Process for the preparation of compounds of formula (I) according to claim 1, characterised in that there is used as starting material the compound of formula (II):



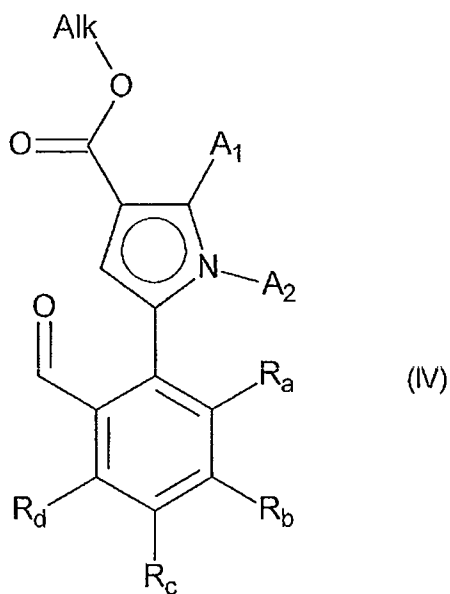
wherein R_a , R_b , R_c and R_d are as defined for formula (I),

which compound of formula (II) is subjected to a Heck reaction, in an aqueous or organic medium, in the presence of a palladium catalyst, of a base, of a phosphine and of the compound of formula (III):



wherein the groups A_1 and A_2 are as defined for formula (I) and Alk represents a linear or branched (C_1 - C_6)alkyl,

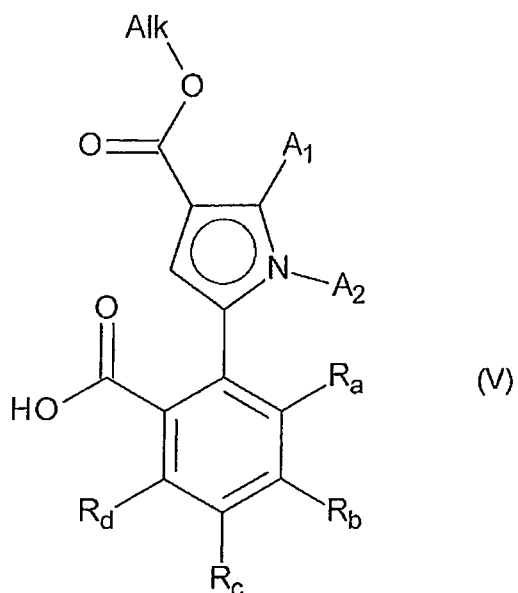
to obtain the compound of formula (IV):



5

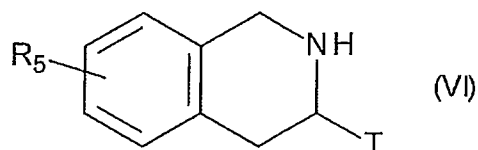
wherein A_1 , A_2 , R_a , R_b , R_c and R_d are as defined for formula (I) and Alk is as defined hereinbefore,

the aldehyde function of which compound of formula (IV) is oxidised to a carboxylic acid to form the compound of formula (V):



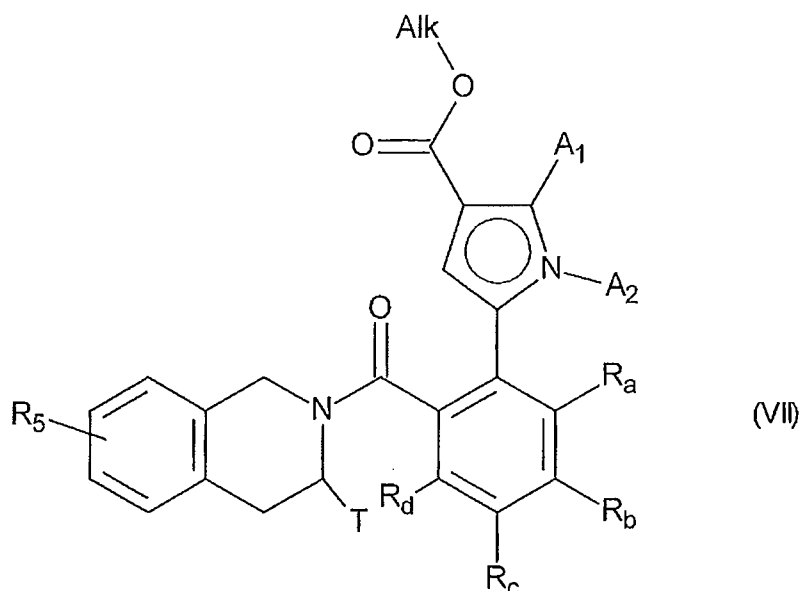
wherein A_1 , A_2 , R_a , R_b , R_c and R_d are as defined for formula (I) and Alk is as defined hereinbefore,

which compound of formula (V) is then subjected to peptide coupling with a compound of
 5 formula (VI):



wherein T and R_5 are as defined for formula (I),

to yield the compound of formula (VII):



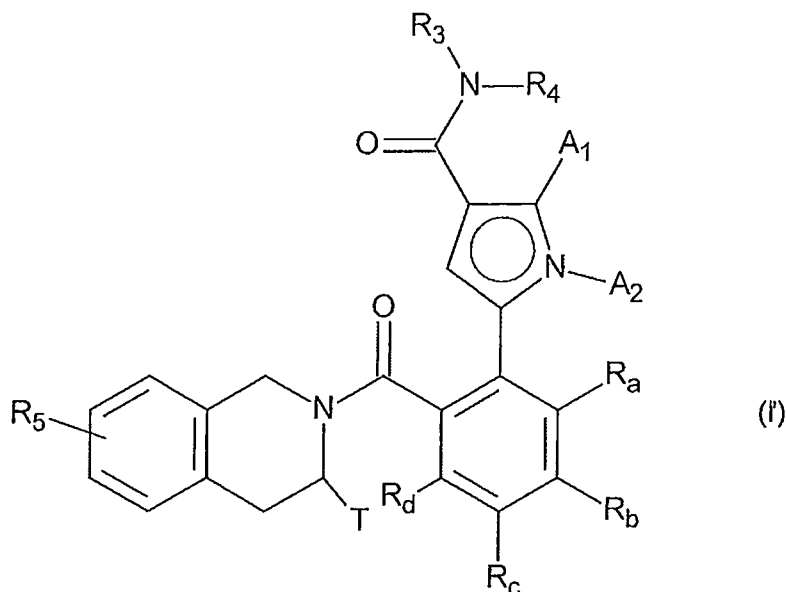
wherein A_1 , A_2 , R_a , R_b , R_c , R_d , T and R_5 are as defined for formula (I) and Alk is as defined hereinbefore,

the ester function of which compound of formula (VII) is hydrolysed to yield the
 5 corresponding carboxylic acid or carboxylate, which may be converted into an acid derivative such as the corresponding acyl chloride or anhydride before being coupled with an amine NHR_3R_4 wherein R_3 and R_4 have the same meanings as for formula (I), to yield the compound of formula (I),

which compound of formula (I) may be purified according to a conventional separation
 10 technique, which is converted, if desired, into its addition salts with a pharmaceutically acceptable acid or base and which is optionally separated into its isomers according to a conventional separation technique,

it being understood that, at any time considered appropriate in the course of the above-described process, certain groups (hydroxy, amino...) of the reagents or intermediates of
 15 synthesis may be protected and then deprotected according to the requirements of synthesis.

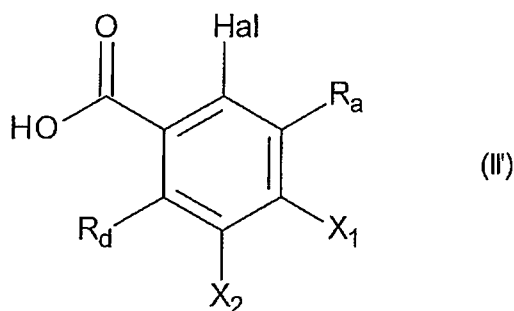
16. Process for the preparation of compounds of formula (I'), particular cases of the compounds of formula (I) according to claim 1 as defined hereinbelow:



wherein:

- A_1 , A_2 , R_a , R_d , R_3 , R_4 , T and R_5 are as defined for formula (I),
- R_b and R_c are such that one represents a hydrogen and the other a group selected from R_7 -CO-NH-(C₀-C₆)alkyl-, R_7 -SO₂-NH-(C₀-C₆)alkyl-, R_7 -NH-CO-NH-(C₀-C₆)alkyl- and R_7 -O-CO-NH-(C₀-C₆)alkyl-, R_7 being as defined for formula (I),

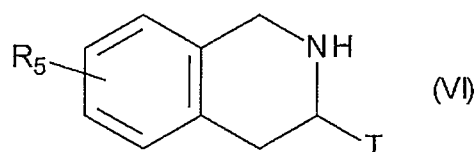
which preparation process uses as starting material a compound of formula (II'):



wherein:

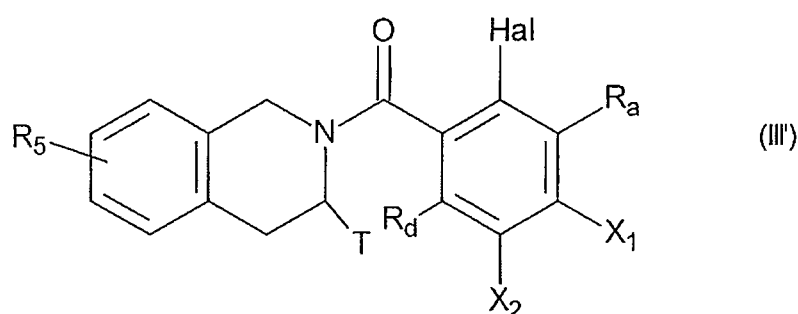
- R_a and R_d are as defined for formula (I),
- Hal represents a halogen atom,
- X_1 and X_2 are such that one represents a (C₀-C₆)alkyl-NH₂ group while the other represents a hydrogen atom,

which compound of formula (II') is then subjected to peptide coupling with a compound of formula (VI):



wherein T and R₅ are as defined for formula (I),

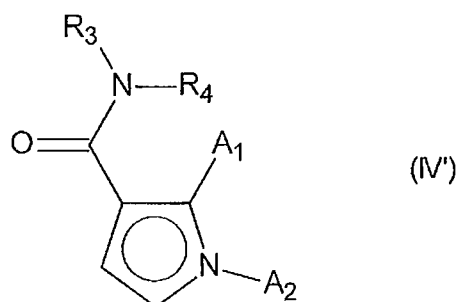
5 to yield the compound of formula (III'):



wherein:

- R_a, R_d, T and R₅ are as defined for formula (I),
- Hal represents a halogen atom,
- 10 - X₁ and X₂ are such that one represents a (C₀-C₆)alkyl-NH₂ group while the other represents a hydrogen atom,

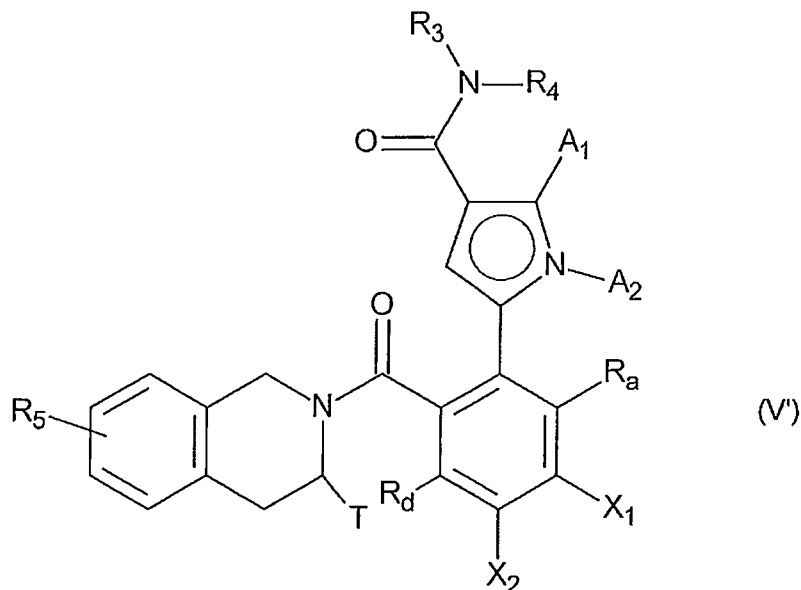
which compound of formula (III') is subjected to a Heck reaction, in an aqueous or organic medium, in the presence of a palladium catalyst, of a base, of a phosphine and of a compound of formula (IV'):



15

wherein A₁, A₂, R₃ and R₄ are as defined for formula (I),

to form the compound of formula (V'):



wherein:

- A₁, A₂, R_a, R_d, R₃, R₄, T and R₅ are as defined for formula (I),
- X₁ and X₂ are such that one represents a (C₀-C₆)alkyl-NH₂ group while the other represents a hydrogen atom,

which compound of formula (V') is then subjected to an acylation or sulphonylation reaction to yield the compound of formula (I'),

which compound of formula (I') may be purified according to a conventional separation technique, which is converted, if desired, into its addition salts with a pharmaceutically acceptable acid or base and which is optionally separated into its isomers according to a conventional separation technique,

it being understood that, at any time considered appropriate in the course of the above-described process, certain groups (hydroxy, amino...) of the reagents or intermediates of synthesis may be protected and then deprotected according to the requirements of synthesis.

17. Process according to claim 15 or 16 for the preparation of a compound of formula (I) wherein one of the groups R_3 or R_4 is substituted by a hydroxy function, characterised in that the amine NHR_3R_4 is subjected beforehand to a reaction protecting the hydroxy function prior to any coupling with the carboxylic acid formed from the compound of formula (VII), or with a corresponding acid derivative thereof, the resulting protected compound of formula (I) subsequently undergoes a deprotection reaction and is then optionally converted into one of its addition salts with a pharmaceutically acceptable acid or base.

18. Pharmaceutical composition comprising a compound of formula (I) according to any one of claims 1 to 14 or an addition salt thereof with a pharmaceutically acceptable acid or base in combination with one or more pharmaceutically acceptable excipients.

19. Pharmaceutical composition according to claim 18 for use as a pro-apoptotic agent.

20. Pharmaceutical composition according to claim 18 for use in the treatment of cancers, auto-immune diseases and diseases of the immune system.

21. Pharmaceutical composition according to claim 18 for use in the treatment of cancers of the bladder, brain, breast and uterus, chronic lymphoid leukaemias, colorectal cancer, cancers of the oesophagus and liver, lymphoblastic leukaemias, non-Hodgkin lymphomas, melanomas, malignant haemopathies, myelomas, ovarian cancer, non-small-cell lung cancer, prostate cancer and small-cell lung cancer.

22. Use of a pharmaceutical composition according to claim 18 in the manufacture of a medicament for use as a pro-apoptotic agent.

23. Use of a pharmaceutical composition according to claim 18 in the manufacture of a medicament intended for the treatment of cancers, diseases of the immune system and auto-immune diseases.

24. Use of a pharmaceutical composition according to claim 18 in the manufacture of a medicament intended for the treatment of cancers of the bladder, brain, breast and uterus, chronic lymphoid leukaemias, colorectal cancer, cancers of the oesophagus and liver, lymphoblastic leukaemias, non-Hodgkin lymphomas, melanomas, malignant haemopathies, myelomas, ovarian cancer, non-small-cell lung cancer, prostate cancer and small-cell lung cancer.

25. Compound of formula (I) according to one of claims 1 to 14, or an addition salt thereof with a pharmaceutically acceptable acid or base, for use in the treatment of cancers of the bladder, brain, breast and uterus, chronic lymphoid leukaemias, colorectal cancer, cancers of the oesophagus and liver, lymphoblastic leukaemias, non-Hodgkin lymphomas, melanomas, malignant haemopathies, myelomas, ovarian cancer, non-small-cell lung cancer, prostate cancer and small-cell lung cancer.

26. Use of a compound of formula (I) according to one of claims 1 to 14, or an addition salt thereof with a pharmaceutically acceptable acid or base, in the manufacture of a medicament intended for the treatment of cancers of the bladder, brain, breast and uterus, chronic lymphoid leukaemias, colorectal cancer, cancers of the oesophagus and liver, lymphoblastic leukaemias, non-Hodgkin lymphomas, melanomas, malignant haemopathies, myelomas, ovarian cancer, non-small-cell lung cancer, prostate cancer and small-cell lung cancer.

27. Association of a compound of formula (I) according to any one of claims 1 to 14 with an anti-cancer agent selected from genotoxic agents, mitotic poisons, anti-metabolites, proteasome inhibitors, kinase inhibitors and antibodies.

28. Pharmaceutical composition comprising an association according to claim 27 in combination with one or more pharmaceutically acceptable excipients.

29. Association according to claim 27 for use in the treatment of cancers.

30. Use of an association according to claim 27 in the manufacture of a medicament for use in the treatment of cancers.

31. Compound of formula (I) according to any one of claims 1 to 14 for use in association with radiotherapy in the treatment of cancers.