

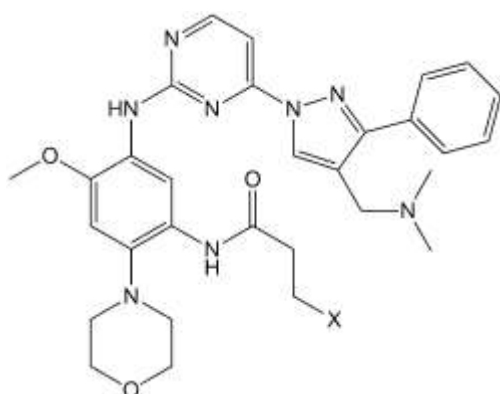
CLAIMS

1. A process for preparing N-(5-((4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)pyrimidin-2-yl)amino)-4-methoxy-2-morpholinophenyl)acrylamide or a pharmaceutically acceptable salt thereof, the process comprising

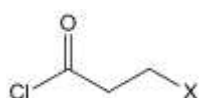
(a) reacting N1-(4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)pyrimidin-2-yl)-6-methoxy-4-morpholinobenzene-1,3-diamine with a compound of Formula 4 to obtain a compound of Formula 2; and

(b) reacting the compound of Formula 2 with a base to obtain N-(5-((4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)pyrimidin-2-yl)amino)-4-methoxy-2-morpholinophenyl)acrylamide:

<Formula 2>



<Formula 4>



wherein, X is halogen.

2. The process according to claim 1, wherein the reacting of Step (a) is carried out in the presence of one or more base(s) selected from the group consisting of potassium tert-butoxide, sodium hydroxide, potassium hydroxide, lithium hydroxide, sodium hydride, sodium carbonate, sodium bicarbonate, potassium carbonate, potassium phosphate, sodium phosphate, 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,4-diazabicyclo[2.2.2]octane, 1,5-diazabicyclo[4.3.0]non-5-ene, pyridine, triethylamine, diisopropylamine and diisopropylethylamine.

3. The process according to claim 1, wherein the reacting of Step (a) is carried out in the presence of a solvent selected from the group consisting of acetonitrile, methyl ethyl ketone,

acetone, methyl isobutyl ketone, dichloromethane, dichloroethane, dimethylformamide, dimethylacetamide, dimethyl sulfoxide, tetrahydrofuran, C₁~C₅ alcohol, toluene, ethyl acetate, isopropyl acetate, diethyl ether, water and a mixture thereof.

4. The process according to claim 3, wherein the solvent is selected from the group consisting of acetonitrile, tetrahydrofuran, methyl ethyl ketone, acetone, dichloromethane, water and a mixture thereof.

5. The process according to claim 1, wherein the base used in Step (b) is one or more selected from the group consisting of potassium tert-butoxide, sodium hydroxide, potassium hydroxide, lithium hydroxide, sodium hydride, sodium carbonate, sodium bicarbonate, potassium carbonate, potassium phosphate, sodium phosphate, 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,4-diazabicyclo[2.2.2]octane, 1,5-diazabicyclo[4.3.0]non-5-ene, pyridine, triethylamine, diisopropylamine and diisopropylethylamine.

6. The process according to claim 5, wherein the base is one or more selected from the group consisting of sodium hydroxide, triethylamine and diisopropylamine.

7. The process according to claim 1, wherein the reacting of Step (b) is carried out in the presence of a solvent selected from the group consisting of acetonitrile, methyl ethyl ketone, acetone, methyl isobutyl ketone, dichloromethane, dichloroethane, dimethylformamide, dimethylacetamide, dimethyl sulfoxide, tetrahydrofuran, C₁~C₅ alcohol, toluene, ethyl acetate, isopropyl acetate, diethyl ether, water and a mixture thereof.

8. The process according to claim 7, wherein the solvent is selected from the group consisting of acetonitrile, tetrahydrofuran, methyl ethyl ketone, acetone, dichloromethane, water and a mixture thereof.

9. The process according to claim 1, wherein Step (a) and Step (b) are carried out in a one-pot reaction.

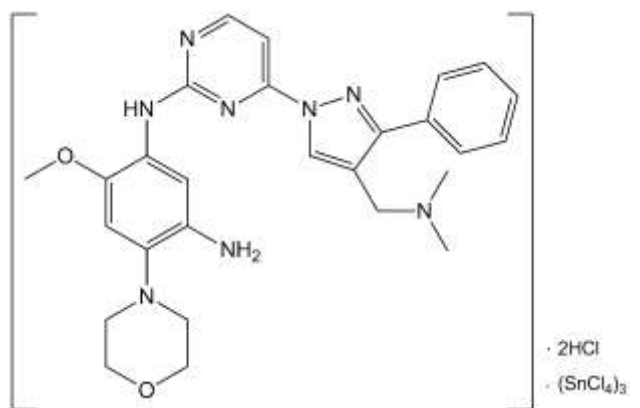
10. The process according to claim 1, wherein the N1-(4-(4-((dimethylamino)methyl)-3-

phenyl-1H-pyrazol-1-yl)pyrimidin-2-yl)-6-methoxy-4-morpholinobenzene-1,3-diamine in Step (a) is obtained by a process comprising

(i) reacting 4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)-N-(2-methoxy-4-morpholino-5-nitrophenyl)pyrimidin-2-amine with tin chloride in the presence of hydrochloric acid to obtain a complex of Formula 5 and

(ii) reacting the complex of Formula 5 with a base to obtain N1-(4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)pyrimidin-2-yl)-6-methoxy-4-morpholinobenzene-1,3-diamine:

<Formula 5>



11. The process according to claim 10, wherein the reacting of Step (i) is carried out in the presence of one or more solvent(s) selected from the group consisting of water, C₁~C₁₀ alcohol, dichloromethane, tetrahydrofuran, acetonitrile and ethyl acetate.

12. The process according to claim 10, wherein the base used in Step (ii) is one or more selected from the group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate, sodium bicarbonate, potassium carbonate, potassium phosphate, and sodium phosphate.

13. The process according to claim 10, wherein the 4-(4-((dimethylamino)methyl)-3-phenyl-1H-pyrazol-1-yl)-N-(2-methoxy-4-morpholino-5-nitrophenyl)pyrimidin-2-amine is obtained by reacting 1-(2-((2-methoxy-4-morpholino-5-nitrophenyl)amino)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde with dimethylamine or a salt thereof.

14. The process according to claim 13, wherein the reacting is carried out in the presence of one or more reducing agent(s) selected from the group consisting of sodium

triacetoxyborohydride, sodium cyanoborohydride and sodium borohydride.

15. The process according to claim 13, wherein the 1-(2-((2-methoxy-4-morpholino-5-nitrophenyl)amino)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde is obtained by reacting 4-chloro-N-(2-methoxy-4-morpholino-5-nitrophenyl)pyrimidin-2-amine with 3-phenyl-1H-pyrazole-4-carbaldehyde.

16. The process according to claim 15, wherein the 4-chloro-N-(2-methoxy-4-morpholino-5-nitrophenyl)pyrimidin-2-amine is obtained by reacting N-(2-methoxy-4-morpholino-5-nitrophenyl)formamide with 4-chloro-2-(methylsulfonyl)pyrimidine.

17. The process according to claim 16, wherein the N-(2-methoxy-4-morpholino-5-nitrophenyl)formamide is obtained by performing a formylation of 2-methoxy-4-morpholino-5-nitroaniline.

18. The process according to claim 17, wherein the formylation is carried out with a mixture of acetic acid and formic acid.

19. The process according to claim 16, wherein the 4-chloro-2-(methylsulfonyl)pyrimidine is obtained by performing an oxidation of 4-chloro-2-(methylthio)pyrimidine.

20. The process according to claim 19, wherein the oxidation is carried out with one or more oxidizing agent(s) selected from the group consisting of potassium permanganate, chromic acid, oxygen, hydrogen peroxide and 3-chloroperbenzoic acid.

21. The process according to claim 13, wherein the 1-(2-((2-methoxy-4-morpholino-5-nitrophenyl)amino)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde is obtained by reacting N-(2-methoxy-4-morpholino-5-nitrophenyl)formamide with 1-(2-(methylsulfonyl)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde.

22. The process according to claim 21, wherein the reacting is carried out in the presence of one or more base(s) selected from the group consisting of sodium C₁~C₆ alkoxide, potassium C₁~C₆ alkoxide, sodium carbonate, potassium carbonate, and potassium phosphate.

23. The process according to claim 21, wherein the reacting is carried out in the presence of one or more solvent(s) selected from the group consisting of dimethylformamide, dimethylacetamide, dichloromethane, dimethyl sulfoxide, tetrahydrofuran, hexamethylphosphoramide, C₁~C₅ alcohol, diethyl ether, ethyl acetate, acetonitrile and acetone.

24. The process according to claim 21, wherein the 1-(2-(methylsulfonyl)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde is obtained by reacting 1-(2-(methylthio)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde with an oxidizing agent.

25. The process according to claim 24, wherein the oxidizing agent is one or more selected from the group consisting of potassium permanganate, chromic acid, oxygen, hydrogen peroxide and 3-chloroperbenzoic acid.

26. The process according to claim 24, wherein the reacting is carried out in the presence of one or more solvent(s) selected from the group consisting of C₁~C₅ alcohol, carbon tetrachloride, chloroform, dichloromethane, acetone, methyl ethyl ketone, methyl isobutyl ketone, cyclohexanone, pentane, hexane, heptane, octane, nonane, decane, undecane, dodecane, cyclohexane, petroleum ether, kerosene, toluene, xylene, mesitylene and benzene.

27. The process according to claim 24, wherein the 1-(2-(methylthio)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde is obtained by reacting 4-chloro-2-(methylthio)pyrimidine with 3-phenyl-1H-pyrazole-4-carbaldehyde.

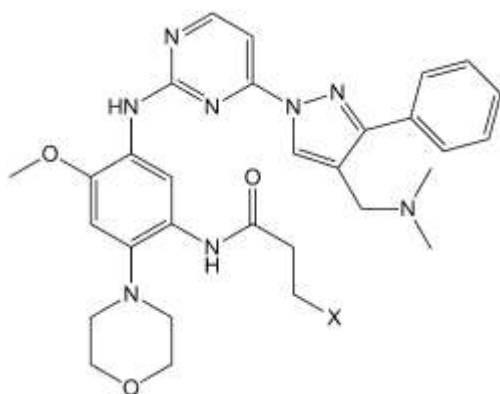
28. The process according to claim 27, wherein the reacting is carried out in the presence of one or more base(s) selected from the group consisting of potassium tert-butoxide, sodium hydroxide, potassium hydroxide, sodium hydride, sodium carbonate, potassium carbonate, potassium phosphate, sodium phosphate, 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,4-diazabicyclo[2.2.2]octane, 1,5-diazabicyclo[4.3.0]non-5-ene, pyridine, triethylamine, diisopropylamine and diisopropylethylamine.

29. The process according to claim 27, wherein the reacting is carried out in the presence of

one or more solvent(s) selected from the group consisting of dichloromethane, dichloroethane, dimethylformamide, dimethylacetamide, dimethyl sulfoxide, tetrahydrofuran, C₁~C₅ alcohol, ethyl acetate, acetone, methyl ethyl ketone, acetonitrile and toluene.

30. A compound of Formula 2 or salt thereof:

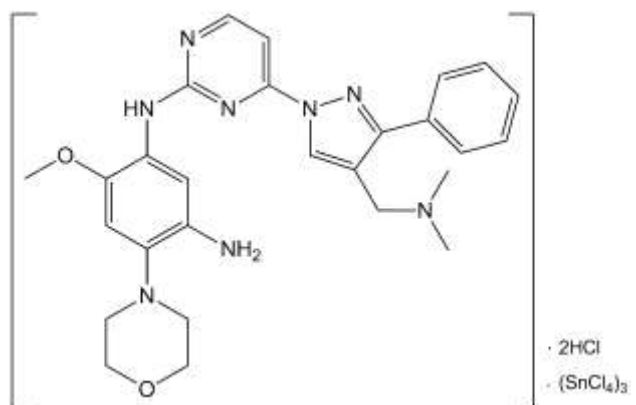
<Formula 2>



wherein, X is halogen.

31. A complex of Formula 5:

<Formula 5>



32. A compound, wherein said compound is 1-(2-(methylsulfonyl)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde.

33. A compound, wherein said compound is 1-(2-(methylthio)pyrimidin-4-yl)-3-phenyl-1H-pyrazole-4-carbaldehyde.