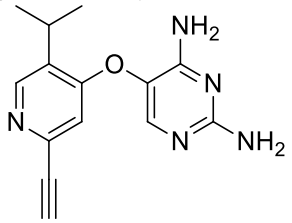
WHAT IS CLAIMED IS:

Claim1. Crystalline form I of compound A anhydrate:



Compound A anhydrate

the crystalline form I has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 11.9±0.2°, 12.3±0.2°, 13.9±0.2°, 19.8±0.2° and 20.3±0.2°.

Claim 2. The crystalline form I of compound A anhydrate according to claim 1, wherein the crystalline form I has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.1±0.2°, 11.9±0.2°, 12.3±0.2°, 13.9±0.2°, 17.8±0.2°, 18.6±0.2°, 19.8±0.2° and 20.3±0.2°.

Claim 3. The crystalline form I of compound A anhydrate according to claim 1 or 2, wherein the crystalline form I has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 6.2±0.2°, 10.1±0.2°, 11.9±0.2°, 12.3±0.2°, 13.9±0.2°, 16.9±0.2°, 17.8±0.2°, 18.6±0.2°, 19.8±0.2°, 20.3±0.2°, 21.8±0.2°, 23.0±0.2°, 23.6±0.2°, 24.1±0.2°, 26.2±0.2°, 26.5±0.2°, 27.8±0.2°, 28.5±0.2°, 29.3±0.2° and 30.6±0.2°.

Claim 4. The crystalline form I of compound A anhydrate according to any one of claims 1-5, wherein the crystalline form I has a DSC graph comprising endothermic/exothermic peaks at 245/255°C.

Claim 5. The crystalline form I of compound A anhydrate according to any one of claims 1-6, wherein the crystalline form I has a weight loss of 0.1% when heated to 100-150°C in a thermogravimetric analysis.

Claim 6. A method for preparing the crystalline form I of compound A anhydrate according to any one of claims 1-5, comprising the following steps:

1) adding compound A to water, followed by addition of an acid, stirring to dissolve compound A and obtain a solution, which is optionally filtered to obtain a filtrate;

2) adding a base to the solution or filtrate obtained in step 1), and collecting the precipitated solid by filtration; and

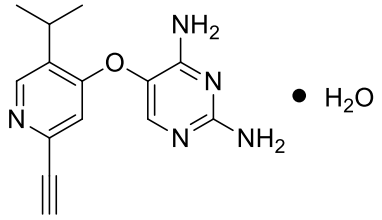
3) adding the obtained solid to water and stirring, filtering to collect the solid, which is optionally dried to obtain crystalline form I;

alternatively, the method comprising dissolving compound A in a good solvent to form a solution, then adding an anti-solvent thereto, and stirring to allow the precipitation of a solid, which is filtered to obtain the crystalline form, wherein the good solvent is a cyclic ether having 3-10 carbon atoms; and the anti-solvent is a hydrocarbon having 5-10 carbon atoms or a linear ether having 2-6 carbon atoms.

Claim 7. The method according to claim 6, wherein the good solvent is furans or dioxanes; and/or the anti-solvent is selected from alkanes, halogenated alkanes, alkenes, alkynes, aromatic hydrocarbons and linear ethers having 2-6 carbon atoms.

Claim 8. The method according to claim 6 or 7, wherein the good solvent is tetrahydrofuran, 2-methyltetrahydrofuran or dioxane; and/or the anti-solvent is dichloromethane, trichloromethane (chloroform), n-hexane, n-heptane, toluene, diethyl ether, diisopropyl ether or methyl *tert*-butyl ether.

Claim 9. Crystalline form II of compound A monohydrate:



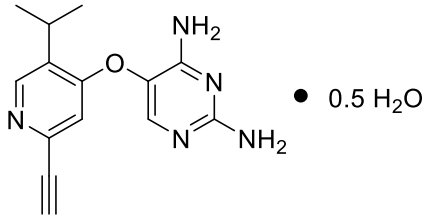
Compound A monohydrate

the crystalline form II has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 13.0±0.2°, 19.5±0.2° and 19.9±0.2°.

Claim 10. The crystalline form II of compound A monohydrate according to claim 9, wherein the crystalline form II has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 9.6±0.2°, 13.0±0.2°, 19.5±0.2°, 19.9±0.2° and 22.7±0.2°.

Claim 11. The crystalline form II of compound A monohydrate according to claim 9 or 10, wherein the crystalline form II has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 9.6±0.2°, 10.9±0.2°, 13.0±0.2°, 14.9±0.2°, 15.8±0.2°, 16.8±0.2°, 19.5±0.2°, 19.9±0.2°, 22.7±0.2°, 23.7±0.2°, 25.2±0.2°, 26.0±0.2°, 28.5±0.2°, 29.0±0.2°, 30.0±0.2° and 32.5±0.2°.

Claim 12. Crystalline form III of compound A hemihydrate:



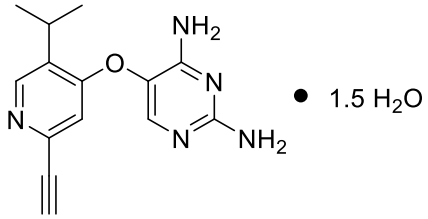
Compound A hemihydrate

the crystalline form III has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.8±0.2° and 20.5±0.2°.

Claim 13. The crystalline form III of compound A hemihydrate according to claim 12, wherein the crystalline form III has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.8±0.2°, 19.3±0.2°, 20.5±0.2°, 21.7±0.2° and 26.9±0.2°.

Claim 14. The crystalline form III of compound A hemihydrate according to claim 12 or 13, wherein the crystalline form III has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.8±0.2°, 13.0±0.2°, 15.0±0.2°, 15.4±0.2°, 16.5±0.2°, 17.3±0.2°, 19.3±0.2°, 19.9±0.2°, 20.5±0.2°, 21.7±0.2°, 23.3±0.2°, 25.1±0.2°, 26.5±0.2°, 26.9±0.2°, 28.7±0.2° and 32.2±0.2°.

Claim 15. Crystalline form IV of compound A sesquihydrate:



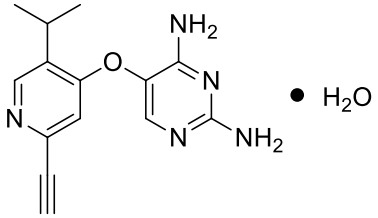
Compound A sesquihydrate

the crystalline form IV has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 12.3±0.2°, 21.3±0.2° and 24.1±0.2°.

Claim 16. The crystalline form IV of compound A sesquihydrate according to claim 15, wherein the crystalline form IV has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 12.3±0.2°, 12.6±0.2°, 17.2±0.2°, 20.0±0.2°, 20.6±0.2°, 21.3±0.2°, 23.8±0.2°, 24.1±0.2°, 25.0±0.2° and 27.9±0.2°.

Claim 17. The crystalline form IV of compound A sesquihydrate according to claim 15 or 16, wherein the crystalline form IV has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 12.3±0.2°, 12.6±0.2°, 14.3±0.2°, 17.2±0.2°, 20.0±0.2°, 20.6±0.2°, 21.3±0.2°, 23.2±0.2°, 23.8±0.2°, 24.1±0.2°, 25.0±0.2°, 25.7±0.2°, 27.9±0.2°, 31.2±0.2° and 31.7±0.2°.

Claim 18. Crystalline form V of compound A monohydrate:



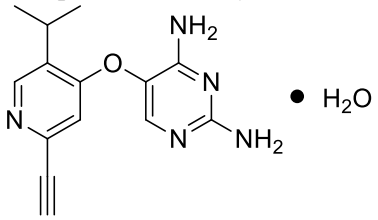
Compound A monohydrate

the crystalline form V has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 14.1±0.2°, 21.0±0.2° and 29.6±0.2°.

Claim 19. The crystalline form V of compound A monohydrate according to claim 18, wherein the crystalline form V has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 8.7±0.2°, 9.4±0.2°, 11.9±0.2°, 14.1±0.2°, 15.8±0.2°, 16.8±0.2°, 18.9±0.2°, 19.9±0.2°, 20.6±0.2°, 21.0±0.2°, 22.5±0.2° and 29.6±0.2°.

Claim 20. The crystalline form V of compound A monohydrate according to claim 18 or 19, wherein the crystalline form V has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 8.7±0.2°, 9.4±0.2°, 11.6±0.2°, 11.9±0.2°, 12.4±0.2°, 14.1±0.2°, 14.5±0.2°, 15.8±0.2°, 16.2±0.2°, 16.8±0.2°, 17.6±0.2°, 18.2±0.2°, 18.9±0.2°, 19.9±0.2°, 20.6±0.2°, 21.0±0.2°, 22.5±0.2°, 23.0±0.2°, 23.6±0.2°, 24.4±0.2°, 25.2±0.2°, 27.0±0.2° and 29.6±0.2°.

Claim 21. Crystalline form VI of compound A monohydrate:



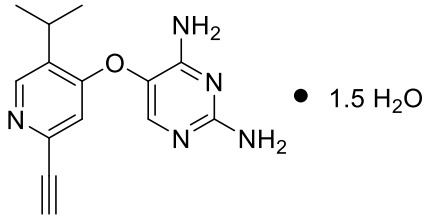
Compound A monohydrate

the crystalline form VI has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.4±0.2°, 12.1±0.2°, 16.6±0.2°, 20.7±0.2°, 22.8±0.2° and 27.3±0.2°.

Claim 22. The crystalline form VI of compound A monohydrate according to claim 21, wherein the crystalline form VI has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 8.7±0.2°, 10.4±0.2°, 12.1±0.2°, 15.4±0.2°, 16.6±0.2°, 19.5±0.2°, 20.7±0.2°, 21.2±0.2°, 22.8±0.2° and 27.3±0.2°.

Claim 23. The crystalline form VI of compound A monohydrate according to claim 21 or 22, wherein the crystalline form VI has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 8.7±0.2°, 10.4±0.2°, 12.1±0.2°, 13.4±0.2°, 14.7±0.2°, 15.4±0.2°, 16.6±0.2°, 17.4±0.2°, 19.5±0.2°, 20.7±0.2°, 21.2±0.2°, 22.1±0.2°, 22.8±0.2°, 23.6±0.2°, 26.0±0.2°, 27.3±0.2°, 28.0±0.2° and 30.4±0.2°.

Claim 24. Crystalline form VII of compound A sesquihydrate:



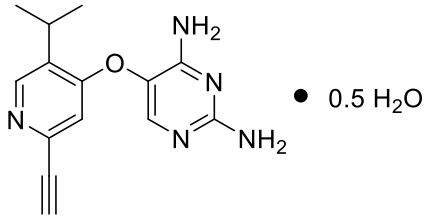
Compound A sesquihydrate

the crystalline form VII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 13.1±0.2°, 19.9±0.2° and 20.2±0.2°.

Claim 25. The crystalline form VII of compound A sesquihydrate according to claim 24, wherein the crystalline form VII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 13.1±0.2°, 16.9±0.2°, 19.9±0.2°, 20.2±0.2°, 24.9±0.2° and 28.8±0.2°.

Claim 26. The crystalline form VII of compound A sesquihydrate according to claim 24 or 25, wherein the crystalline form VII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 9.4±0.2°, 10.8±0.2°, 13.1±0.2°, 15.4±0.2°, 16.9±0.2°, 18.8±0.2°, 19.9±0.2°, 20.2±0.2°, 22.2±0.2°, 23.2±0.2°, 24.9±0.2°, 26.4±0.2° and 28.8±0.2°.

Claim 27. Crystalline form VIII of compound A hemihydrate:



Compound A hemihydrate

the crystalline form VIII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 13.0±0.2°, 16.8±0.2°, 19.4±0.2°, 21.7±0.2°, 22.9±0.2° and 27.4±0.2°.

Claim 28. The crystalline form VIII of compound A hemihydrate according to claim 27, wherein the crystalline form VIII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 10.3±0.2°, 13.0±0.2°, 16.8±0.2°, 19.1±0.2°, 19.4±0.2°, 21.1±0.2°, 21.7±0.2°, 22.9±0.2°, 25.8±0.2° and 27.4±0.2°.

Claim 29. The crystalline form VIII of compound A hemihydrate according to claim 27 or 28, wherein the crystalline form VIII has an XRPD pattern comprising characteristic peaks at diffraction angles (2θ) of 8.7±0.2°, 10.3±0.2°, 10.8±0.2°, 13.0±0.2°, 14.1±0.2°, 14.8±0.2°, 16.8±0.2°, 17.5±0.2°, 19.1±0.2°, 19.4±0.2°, 21.1±0.2°, 21.7±0.2°, 22.3±0.2°, 22.9±0.2°, 25.8±0.2°, 27.4±0.2°, 27.8±0.2°, 30.4±0.2° and 31.6±0.2°.

Claim 30. A pharmaceutical composition comprising the crystalline form I of any one of claims 1-5, the crystalline form II of any one of claims 9-11, the crystalline form III of any one of claims 12-14, the crystalline form IV of any one of claims 15-17, the crystalline form V of any one of claims 18-20, the crystalline form VI of any one of claims 21-23, the crystalline form VII of any one of claims 24-26, or the crystalline form VIII of any one of claims 27-29, and one or more pharmaceutically acceptable carriers.

Claim 31. Use of the crystalline form I of any one of claims 1-5, the crystalline form II of any one of claims 9-11, the crystalline form III of any one of claims 12-14, the crystalline form IV of any one of claims 15-17, the crystalline form V of any one of claims 18-20, the crystalline form VI of any one of claims 21-23, the crystalline form VII of any one of claims 24-26, or the crystalline form VIII of any one of claims 27-29 in the manufacture of a medicament for the prevention or treatment of a disease mediated by a P2X3 and/or P2X2/3 receptor antagonist, wherein the disease is selected from the group consisting of a urinary tract disease selected from reduced bladder capacity, frequent micturition, urge incontinence, stress incontinence, bladder hyperreactivity, benign prostatic hypertrophy, prostatitis, detrusor

hyperreflexia, nocturia, urinary urgency, pelvic hypersensitivity, urethritis, pelvic pain syndrome, prostatodynia, cystitis, and idiopathic bladder hypersensitivity; a pain disease selected from inflammatory pain, surgical pain, visceral pain, dental pain, premenstrual pain, central pain, pain due to burns, migraine and cluster headaches, nerve injury, neuritis, neuralgia, poisoning, ischemic injury, interstitial cystitis, cancer pain, viral, parasitic or bacterial infection, post-traumatic injury and pain associated with irritable bowel syndrome; a cardiovascular system disease; a respiratory disease selected from chronic obstructive pulmonary disease, asthma and bronchospasm; a gastrointestinal disease selected from irritable bowel syndrome, inflammatory bowel disease, biliary colic, renal colic, and pain associated with gastrointestinal distension.

Claim 32.The use according to claim 31, wherein the cardiovascular system disease is hypertension; and/or the irritable bowel syndrome is diarrhea-dominant irritable bowel syndrome.