

What is Claimed

1. A compound ~~selected from the group consisting of~~that is:

N-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide dihydrochloride monohydrate Form II, wherein one or more hydrogen atoms attached to a carbon atom of the compound are replaced by deuterium atoms;

~~— *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide monohydrochloride anhydrous Form I; and~~

~~— *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide monohydrochloride anhydrous Form III.~~

2. The compound of claim 1 in a crystalline form.

3. ~~The crystalline form of claims 1-2, wherein the crystalline form is~~

~~*N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide—dihydrochloride monohydrate Form II.~~

4.3. ~~The compound~~crystalline form of claim 32, wherein the crystals have unit cell parameters at T=100°K of: a = 10.2837(6) Å, b = 10.4981(6) Å, c = 11.5143(7) Å, α = 83.297(2)°, β = 87.649(2)°, γ = 67.445(2)°, and a triclinic *P*-1 space group.

5.4. ~~The compound~~crystalline form of claim 32, characterized by an x-ray powder diffraction (XRPD) pattern substantially as set forth in Figure 56.

6.5. ~~The compound~~crystalline form of claim 32, characterized by an x-ray powder diffraction (XRPD) pattern having peaks at about 7.7°, 19.3°, 24.0°, 25.7°, and 29.6° 2-θ ± 0.2° 2-θ.

- ~~7.6. The compound crystalline form of claim 32, characterized by differential scanning calorimetry (DSC) pattern substantially as set forth in Figure 89.~~
- ~~8.7. The compound crystalline form of claim 32, characterized by a dynamic vapor sorption (DVS) pattern substantially as set forth in Figure 1415.~~
- ~~9. The crystalline form of claim 2, wherein the crystalline form is Crystalline N-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide monohydrochloride anhydrous Form I.~~
- ~~10. The crystalline form of claim 9, characterized by an x-ray powder diffraction (XRPD) pattern substantially as set forth in Figure 7.~~
- ~~11. The crystalline form of claim 9, characterized by an X-ray powder diffraction (“XRPD”) pattern having peaks at about 13.5°, 20.9°, 26.1°, 26.6°, and 28.3° 2-θ ± 0.2° 2-θ.~~
- ~~12. The crystalline form of claim 9, characterized by a differential scanning calorimetry (DSC) pattern substantially as set forth in Figure 10.~~
- ~~13. The crystalline form of claim 2, wherein the crystalline form is crystalline N-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide monohydrochloride anhydrous Form III.~~
- ~~14. The crystalline form of claim 13, characterized by an x-ray powder diffraction (XRPD) pattern substantially as set forth in Figure 8.~~
- ~~15. The crystalline form of claim 13, characterized by an X-ray powder diffraction (“PXRD”) pattern having peaks at about 12.7°, 14.6°, 17.8°, 19.7°, and 23.3° 2-θ ± 0.2° 2-θ.~~

~~16. The crystalline form of claim 13, characterized by a differential scanning calorimetry (DSC) pattern substantially as set forth in Figure 11.~~

~~17.8.~~ A pharmaceutical composition comprising a compound of any one of claims 1-~~16~~7.

~~18. The pharmaceutical composition of claim 17, wherein the compound of claim 1 is *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide dihydrochloride monohydrate Form II.~~

~~19.9.~~ The pharmaceutical composition of claims ~~17-18~~8, wherein *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide dihydrochloride monohydrate Form II is present at an amount equivalent to 50 mg, 100 mg, 150 mg, or 200 mg of free base *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide.

~~20.10.~~ The pharmaceutical composition of ~~any one of claims 17-19~~claim 8 or 9 in the form of a tablet.

~~21.11.~~ The pharmaceutical composition of any one of claims ~~17-20~~8-10, wherein after a single oral administration said composition provides:

a $C_{\max}$ in the range of 260 to 405 ng/mL of *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide,

an $AUC_{\inf}$ in the range of 2,057 to 3,214 ng·hr/mL of *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide, or

both a $C_{\max}$ in the range of 260 to 405 ng/mL of *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide and an $AUC_{\inf}$ in the range of 2,057 to 3,214 ng·hr/mL of *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide.

~~22.12.~~ The pharmaceutical composition of claim ~~24~~11, wherein after a single oral administration said composition provides a pharmacokinetic profile substantially similar to that of a dosage form comprising *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide dihydrochloride anhydrous Form I in an amount equivalent to 300 mg of free base *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide, wherein the crystal of *N*-(cyanomethyl)-4-(2-(4-morpholinophenylamino)pyrimidin-4-yl)benzamide dihydrochloride anhydrous Form I is characterized by an X-ray powder diffraction (XRPD) pattern having peaks at 5.5°, 10.1°, 14.9°, 25.1°, and 26.6° 2θ ± 0.2 ° 2θ.

~~23.13.~~ ~~A method for the treatment of a disease associated with Janus Kinase (JAK) which comprises administering to a subject in need an effective amount~~Use of the pharmaceutical composition of any one of claims 188-12, in the manufacture of a medicament for the treatment of a disease associated with Janus Kinase (JAK), wherein the disease is a myeloproliferative disease selected from the group consisting of ~~The method of claim 31 wherein the myeloproliferative disease is selected from the group consisting of~~ polycythemia vera (PV), myelofibrosis, thrombocythemia, essential thrombocythemia (ET), idiopathic myelofibrosis, chronic myelogenous leukemia, systemic mastocytosis (SM), chronic neutrophilic leukemia (CNL), myelodysplastic syndrome (MDS) and systemic mast cell disease (SMCD).