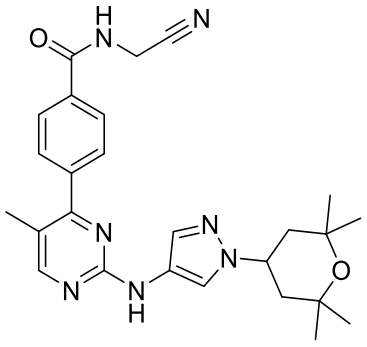
CLAIMS

1. A crystal form I of compound 1, wherein the crystal form I has an X-ray powder diffraction pattern comprising diffraction peaks at the following positions: 8.60°±0.2°, 10.25°±0.2°, 11.96°±0.2°, 14.35°±0.2°, 15.39°±0.2°, 16.59°±0.2°, 17.06°±0.2°, and 18.16°±0.2° 2θ, as determined by using Cu-Kα radiation;



1

.

2. The crystal form I according to claim 1, wherein the crystal form I meets one or more of the following conditions:

(1) the crystal form I has an X-ray powder diffraction pattern further comprising diffraction peaks at one or more of the following positions: 12.77°±0.2°, 13.48°±0.2°, 14.04°±0.2°, 17.27°±0.2°, 18.83°±0.2°, 20.52°±0.2°, 20.77°±0.2°, 21.45°±0.2°, 22.12°±0.2°, 22.79°±0.2°, 23.55°±0.2°, 24.04°±0.2°, 24.40°±0.2°, 25.08°±0.2°, 25.87°±0.2°, 26.51°±0.2°, 26.73°±0.2°, 26.89°±0.2°, 27.36°±0.2°, and 28.29°±0.2° 2θ;

(2) the crystal form I has a differential scanning calorimetry pattern comprising an endothermic peak at 207.4 °C to 209.2 °C;

(3) the crystal form I has a thermogravimetric analysis pattern comprising a weight loss of 0.0% at 30.07 ºC to 208.96 ºC.

3. The crystal form I according to claim 2, wherein the crystal form I has an X-ray powder diffraction pattern further comprising diffraction peaks at one or more of the following positions: 28.93º±0.2º, 29.42º±0.2º, 30.63º±0.2º, 33.00º±0.2º, 33.37º±0.2º, 34.43º±0.2º, and 37.09º±0.2º 2θ.

4. The crystal form I according to claim 2, wherein the crystal form I meets one or more of the following conditions:

(1) the crystal form I has an X-ray powder diffraction pattern at 2θ comprising diffraction peaks as shown in the table below:

Diffraction angle [º 2θ]	d value [Å]	Relative intensity [%]
8.599	10.27532	94.0
10.250	8.62286	41.5
11.957	7.39559	80.8
12.774	6.92428	14.1
13.482	6.56235	13.1
14.043	6.30159	52.8
14.345	6.16938	33.9

15.392	5.75198	16.1
16.594	5.33787	18.7
17.063	5.19224	56.9
17.270	5.13049	27.3
18.156	4.88225	100.0
18.830	4.70888	6.0
20.523	4.32402	26.0
20.765	4.27428	10.0
21.446	4.14001	43.6
22.118	4.01569	17.0
22.792	3.89842	5.7
23.545	3.77553	10.5
24.043	3.69847	13.5
24.406	3.64422	33.5
25.081	3.54761	20.4
25.868	3.44150	2.8
26.508	3.35979	2.8
26.732	3.33219	5.4
26.889	3.31302	9.2
27.360	3.25704	10.2
28.285	3.15261	6.9

28.930	3.08383	30.2
29.419	3.03366	5.0
30.630	2.91642	3.4
33.000	2.71216	3.7
33.370	2.68298	2.6
34.429	2.60282	2.2
37.089	2.42198	2.0

;

(2) the crystal form I has a differential scanning calorimetry pattern comprising an endothermic peak at 207.4 ºC to 209.2 ºC, with a heat of fusion of 123.76 J/g;

(3) the crystal form I has a thermogravimetric analysis pattern substantially as shown in FIG. 3.

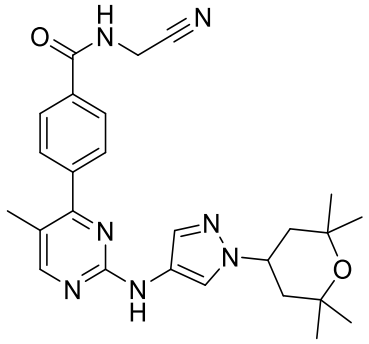
5. The crystal form I according to claim 4, wherein the crystal form I meets one or more of the following conditions:

(1) the crystal form I has an X-ray powder diffraction pattern at 2θ substantially as shown in FIG. 1;

(2) the crystal form I has a differential scanning calorimetry pattern substantially as shown in FIG. 2.

6. A preparation method for the crystal form I according to any one of claims 1 to 5, wherein the preparation method comprises scheme 1 or scheme 2; wherein

the scheme 1 comprises the step of subjecting a solution of the compound 1 in methanol to crystallization to obtain the crystal form I;



1 ;

the scheme 2 comprises the step of cooling a solution of the compound 1 in tetrahydrofuran/methanol and isopropanol to obtain the crystal form I.

7. The preparation method for the crystal form I according to claim 6, wherein the preparation method meets one or more of the following conditions:

(1) the scheme 1 comprises the following operations: at 40 ºC, adding methanol to a solution of the compound 1 and tetrahydrofuran, performing concentration, adding methanol again to a concentrated solution, and stirring for crystallization to obtain the crystal form I,

(2) the scheme 1 further comprises the following post-processing steps: filtering, washing, drying under reduced pressure, and sieving to obtain the crystal form I;

(3) in the scheme 2, the mass ratio of the compound 1 to tetrahydrofuran/methanol is (1 : 3) to (1 : 5);

(4) in the scheme 2, in the tetrahydrofuran/methanol, the mass ratio of tetrahydrofuran to methanol is (2 : 1) to (1 : 2);

(5) in the scheme 2, the mass ratio of the compound 1 to isopropanol is (1 : 11) to (1 : 13);

(6) in the scheme 2, the temperature at which the compound 1 is dissolved in tetrahydrofuran/methanol and isopropanol is 50 °C to 60 °C;

(7) in the scheme 2, the cooling is to lower the temperature to 0 °C to 5 °C;

(8) in the scheme 2, the temperature-holding time after the cooling is 15 to 30 h;

(9) the scheme 2 further comprises the following post-processing steps: filtering, washing, drying under reduced pressure, and sieving to obtain the crystal form I.

8. The preparation method for the crystal form I according to claim 7, wherein the preparation method meets one or more of the following conditions:

(1) in the scheme 1, the temperature at which the compound 1 is dissolved in the tetrahydrofuran to form the solution is 50 °C to 60 °C;

(2) in the scheme 1, the mass ratio of the compound 1 to the tetrahydrofuran is (1 : 8) to (1 : 9);

(3) in the scheme 1, the mass ratio of the compound 1 to the methanol added for the first time is (1 : 16) to (1 : 18);

(4) in the scheme 1, the mass of the concentrated solution is 4 to 6 times of the mass of the compound 1;

(5) in the scheme 1, the mass ratio of the compound 1 to the methanol added for the second time is (1 : 2) to (1 : 3);

(6) in the scheme 2, the mass ratio of the compound 1 to tetrahydrofuran/methanol is 1:4;

(7) in the scheme 2, in the tetrahydrofuran/methanol, the mass ratio of tetrahydrofuran to methanol is 1 : 1;

(8) in the scheme 2, the mass ratio of the compound 1 to isopropanol is 1 : 12;

(9) in the scheme 2, the temperature at which the compound 1 is dissolved in tetrahydrofuran/methanol and isopropanol is 55 ^{o}C;

(10) in the scheme 2, the cooling is to lower the temperature to 0 ^{o}C;

(11) in the scheme 2, the temperature-holding time after the cooling is 24 h.

9. The preparation method for the crystal form I according to claim 8, wherein the preparation method meets one or more of the following conditions:

(1) in the scheme 1, the mass ratio of the compound 1 to the tetrahydrofuran is 1 : 8.7;

(2) in the scheme 1, the mass ratio of the compound 1 to the methanol added for the first time is 1 : 17;

(3) in the scheme 1, the mass of the concentrated solution is 5 times of the mass of the compound 1;

(4) in the scheme 1, the mass ratio of the compound 1 to the methanol added for the second time is 1 : 2.3.

10. The preparation method for the crystal form I according to any one of claims 7 to 9, wherein the scheme 2 comprises the following operations: warming the compound 1 and tetrahydrofuran/methanol, adding isopropanol to dissolve the sample, adding isopropanol again, and cooling to form a suspension to obtain the crystal form I.

11. A pharmaceutical composition, comprising the crystal form I according to any one of claims 1 to 5 and a pharmaceutical exipient.

12. Use of the crystal form I according to any one of claims 1 to 5 in the preparation of a drug for treating and/or preventing a disease related to JAK kinases, wherein

the disease related to JAK kinases is inflammatory bowel disease, psoriasis, vitiligo, atopic dermatitis, systemic lupus erythematosus, asthma, diabetic

nephropathy, chronic myelogenous leukemia, essential thrombocythemia, polycythemia vera, myelofibrosis, breast cancer or ovarian cancer.

13. Use of the crystal form I according to any one of claims 1 to 5 in the preparation of a drug for treating and/or preventing a disease, wherein the disease is inflammatory bowel disease, psoriasis, vitiligo, atopic dermatitis, systemic lupus erythematosus, asthma, diabetic nephropathy, chronic myelogenous leukemia, essential thrombocythemia, polycythemia vera, myelofibrosis, breast cancer or ovarian cancer.