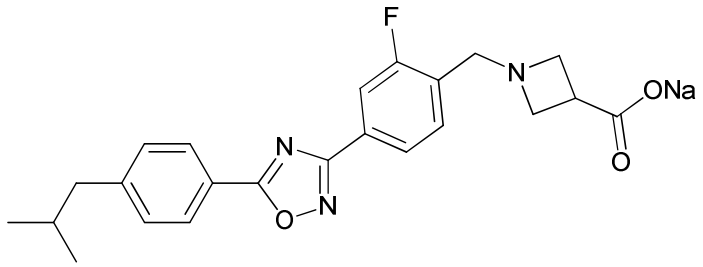
CLAIMS

1. A sodium salt of a compound represented by formula A, having a structure represented by the following formula:



2. The sodium salt according to claim 1, wherein the sodium salt substantially is in a crystal state, and preferably is an anhydrate, a hydrate, or a non-solvate.

3. A crystal form of the sodium salt according to claim 1 or 2, wherein with Cu-Kα radiation, the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions: 4.4±0.2°, 6.6±0.2°, 14.7±0.2, and 17.2±0.2°.

4. The crystal form according to claim 3, wherein the crystal form has an X-ray powder diffraction pattern represented by angle 2θ having characteristic peaks at the following positions with relative intensities as follows:

2θ	Relative intensity %
4.4±0.2°	100
6.6±0.2°	80.8
14.7±0.2°	11.5
15.4±0.2°	2.6
17.2±0.2°	8.6;

preferably, the crystal form has an X-ray powder diffraction pattern as illustrated in FIG. 2.

5. The crystal form according to claim 3 or 4, wherein the crystal form has a Fourier transform infrared spectrum having characteristic peaks at wavenumbers 1560 cm^{-1}, 1505 cm^{-1}, 1476 cm^{-1}, 1417 cm^{-1}, 1365 cm^{-1}, 1276 cm^{-1}, 885 cm^{-1}, 849 cm^{-1}, and 756 cm^{-1}.

6. A method for preparing the sodium salt or the crystal form according to any one of claims 1 to 5, including the following steps:

mixing the compound represented by formula A and sodium hydroxide in a molar ratio of 1:1-1:5 in a solvent selected from the group consisting of a C_1-C_4 alcohol, a C_3-C_4 ketone, a C_4-C_6 ether, water, a nitrile, or a mixture thereof for reaction, removing the solvent after the reaction is complete, and performing drying;

preferably, the solvent is selected from the group consisting of methanol, ethanol, acetone, diethyl ether, water, nitrile, or a mixture thereof;

preferably, the molar ratio of the compound represented by formula A to sodium hydroxide is 1:1.0-1:1.3;

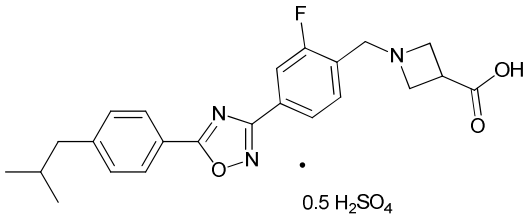
preferably, the reaction is performed at 10-60 ºC, more preferably at room temperature; preferably, the reaction is performed under stirring, and the stirring time is 1-48 h, more preferably 3-24 h;

preferably, the drying is performed under vacuum, and the drying temperature is 10-60 ºC, more preferably 10-40 ºC;

preferably, the drying time is 1-48 h, more preferably 1-24 h;

preferably, the ratio of mass of the compound represented by formula A to volume of the solvent in the method is 1 mg:1 mL-50 mg:1 mL, more preferably 2.5 mg:1 mL-41 mg:1 mL.

7. A sulfate of a compound represented by formula A, having a structure represented by the following formula:



8. The sulfate according to claim 7, wherein the sulfate substantially is in a crystal state, and preferably is an anhydrate, a hydrate, or a non-solvate.

9. A crystal form of the sulfate according to claim 7 or 8, wherein with Cu-Kα radiation, the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions: 5.4±0.2°, 8.1±0.2°, 14.8±0.2°, 16.7±0.2°, and 18.3±0.2°.

10. The crystal form according to claim 9, wherein the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions: 5.4±0.2°, 8.1±0.2°, 14.8±0.2°, 15.6±0.2°, 16.7±0.2°, 18.3±0.2°, 21.0±0.2°, 22.0±0.2°, 22.9±0.2°, 25.2±0.2°, and 26.3±0.2°;

preferably, the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions with relative intensities as follows:

2θ	Relative intensity %
5.4±0.2°	62.3
8.1±0.2°	47.3
10.9±0.2°	9.9
14.8±0.2°	100
15.6±0.2°	12.5
16.7±0.2°	58.6
18.3±0.2°	18.2
19.7±0.2°	15.5
20.5±0.2°	10.1
21.0±0.2°	17.4
22.0±0.2°	18.1
22.9±0.2°	39.3
25.2±0.2°	37.4
26.3±0.2°	36.5;

more preferably, the crystal form has an X-ray powder diffraction pattern as illustrated in FIG. 6.

11. The crystal form according to claim 9 or 10, wherein the crystal form has a Fourier transform infrared spectrum having characteristic peaks at wavenumbers 1733 cm^{-1}, 1438 cm^{-1}, 1346 cm^{-1}, 1230 cm^{-1}, 1184 cm^{-1}, 1109 cm^{-1}, 1063 cm^{-1}, 1009 cm^{-1}, 885 cm^{-1}, 854 cm^{-1}, and

758 cm^{-1}.

12. A method for preparing the sulfate or the crystal form according to any one of claims 7 to 11, including the following steps:

forming a suspension or solution of the compound represented by formula A and a suspension or solution of sulfuric acid in a solvent selected from the group consisting of a C_1-C_4 alcohol, a C_3-C_4 ketone, a cyclic ether, acetonitrile, water, or a mixture thereof respectively, mixing the suspension or solution in a molar ratio of 1:0.4-1:10 of the compound represented by formula A to sulfuric acid for reaction, removing the solvent after the reaction is complete, and performing drying;

preferably, the solvent is selected from the group consisting of methanol, ethanol, n-propanol, acetone, tetrahydrofuran, water, acetonitrile, or a mixture thereof;

preferably, the molar ratio of the compound represented by formula A to sulfuric acid is 1:0.4-1:7.9;

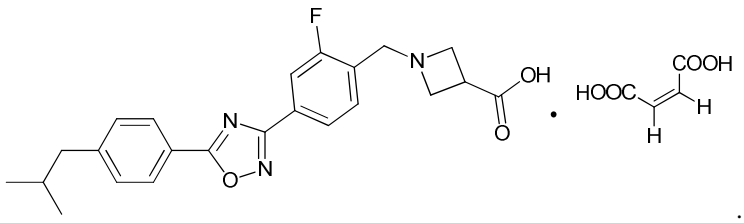
preferably, the reaction is performed at -10-60 ºC, more preferably at 10-40 ºC; preferably, the reaction is performed under stirring, and the stirring time is 1-72 h, more preferably 1-24 h;

preferably, the drying temperature is 10-60 ºC, more preferably 10-40 ºC;

preferably, the drying time is 1-48 h, more preferably 1-24 h;

preferably, the ratio of mass of the compound represented by formula A to volume of the solvent in the method is 1 mg:1 mL-50 mg:1 mL, more preferably 4 mg:1 mL-35 mg:1 mL.

13. A maleate of a compound represented by formula A, having a structure represented by the following formula:



14. The maleate according to claim 13, wherein the maleate substantially is in a crystal state,

and preferably is an anhydrate, a hydrate, or a non-solvate.

15. A crystal form of the maleate according to claim 13 or 14, wherein with Cu-Kα radiation, the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions: 10.6±0.2°, 16.3±0.2°, 19.5±0.2°, 21.5±0.2°, and 26.9±0.2°.

16. The crystal form according to claim 15, wherein the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions: 7.0±0.2°, 10.6±0.2°, 13.6±0.2°, 16.3±0.2°, 19.5±0.2°, 20.1±0.2°, 21.5±0.2°, 24.5±0.2°, and 26.9±0.2°;

preferably, the crystal form has an X-ray powder diffraction pattern characterized by angle 2θ having characteristic peaks at the following positions with relative intensities as follows:

2θ	Relative intensity %
5.3 ±0.2°	3.4
7.0 ±0.2°	5.8
10.6 ±0.2°	100
13.6 ±0.2°	6.6
14.5 ±0.2°	3.2
16.3 ±0.2°	12.2
19.5 ±0.2°	37.7
20.1 ±0.2°	8.6
20.7 ±0.2°	2.8
21.5 ±0.2°	18.3
24.5 ±0.2°	11.4
24.7 ±0.2°	9.6
25.3 ±0.2°	1.8
26.1 ±0.2°	1.9
26.9 ±0.2°	34.5
28.7 ±0.2°	2.2;

more preferably, the crystal form has an X-ray powder diffraction pattern as illustrated in FIG. 10.

17. The crystal form according to claim 15 or 16, wherein the crystal form has a Fourier transform infrared spectrum having characteristic peaks at wavenumbers 1734 cm^{-1}, 1574 cm^{-1}, 1485 cm^{-1}, 1439 cm^{-1}, 1364 cm^{-1}, 1346 cm^{-1}, 1080 cm^{-1}, 1003 cm^{-1}, 893 cm^{-1}, 871 cm^{-1}, 757 cm^{-1}, and 729 cm^{-1}.

18. A method for preparing the maleate or the crystal form according to any one of claims 13 to 17, including the following steps:

forming a suspension or solution of the compound represented by formula A and a suspension or solution of maleic acid in a solvent selected from the group consisting of a C_1-C_4 alcohol, a C_3-C_4 ketone, C_4-C_6 ether, a C_2-C_5 ester, water, or a mixture thereof respectively, mixing the suspension or solution in a molar ratio of 1:1-1:5 of the compound represented by formula A to maleic acid for reaction, removing the solvent after the reaction is complete, and performing drying;

preferably, the solvent is selected from the group consisting of ethanol, acetone, ether, water, ethyl acetate, 1,4-dioxane, or a mixture thereof;

preferably, the molar ratio of the compound represented by formula A to maleic acid is 1:1.0-1:2.6;

preferably, the reaction is performed at -10-60 ºC, more preferably at 10-40 ºC; preferably, the reaction is performed under stirring, and the stirring time is 10-72 h, more preferably 10-24 h;

preferably, the drying temperature is 10-60 ºC, more preferably 10-40 ºC;

preferably, the drying time is 1-48 h, more preferably 1-24 h;

preferably, the ratio of mass of the compound represented by formula A to volume of the solvent in the method is 1 mg:1 mL-50 mg:1 mL, more preferably 4 mg:1 mL-26 mg:1 mL.

19. A pharmaceutical composition, comprising a therapeutically and/or prophylactically effective amount of one or more selected from the group consisting of the sodium salt or the crystal form according to any one of claims 1 to 4, the sulfate or the crystal form according to any one of claims 6 to 11, and the maleate or the crystal form according to any one of claims

13 to 17, and optionally at least one pharmaceutically acceptable carrier or excipient.

20. Use of the sodium salt or the crystal form according to any one of claims 1 to 4, the sulfate or the crystal form according to any one of claims 6 to 11, and the maleate or the crystal form according to any one of claims 13 to 17 in the manufacture of a medicament for treating and/or preventing an S1P1 receptor mediated disease or condition, wherein the S1P1 receptor mediated disease or condition is selected from the group consisting of rheumatoid arthritis, multiple sclerosis, inflammatory enteritis, autoimmune diseases, chronic inflammatory diseases, asthma, inflammatory neuropathy, arthritis, transplantation, Crohn's disease, ulcerative colitis, lupus erythematosus, psoriasis, ischemia-reperfusion injury, solid tumors, angiogenesis related diseases, vascular diseases, pain symptoms, acute viral diseases, inflammatory bowel diseases, insulin and non-insulin dependent diabetes mellitus and other related immune diseases.

21. The use according to claim 20, wherein the S1P1 receptor mediated disease or condition is selected from the group consisting of multiple sclerosis, rheumatoid arthritis, inflammatory enteritis and psoriasis.

22. The use according to claim 20 or 21, wherein the S1P1 receptor mediated disease or condition is Crohn's disease or ulcerative colitis.