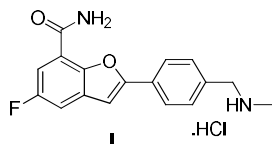


## Claims

1. A polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride as shown in Formula I,



the polymorph is 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form A, 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form B or 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form C, wherein

the powder diffraction pattern of crystal form A comprises 10 or more  $2\theta$  values selected from the group consisting of:  $6.49 \pm 0.1^\circ$ ,  $12.625 \pm 0.1^\circ$ ,  $15.271 \pm 0.1^\circ$ ,  $20.727 \pm 0.1^\circ$ ,  $22.933 \pm 0.1^\circ$ ,  $23.913 \pm 0.1^\circ$ ,  $25.139 \pm 0.1^\circ$ ,  $25.618 \pm 0.1^\circ$ ,  $26.082 \pm 0.1^\circ$ ,  $27.084 \pm 0.1^\circ$ ,  $27.406 \pm 0.1^\circ$ , and  $28.828 \pm 0.1^\circ$ ;

the powder diffraction pattern of crystal form B comprises 10 or more  $2\theta$  values selected from the group consisting of:  $6.145 \pm 0.1^\circ$ ,  $10.318 \pm 0.1^\circ$ ,  $12.459 \pm 0.1^\circ$ ,  $14.914 \pm 0.1^\circ$ ,  $20.806 \pm 0.1^\circ$ ,  $22.832 \pm 0.1^\circ$ ,  $23.295 \pm 0.1^\circ$ ,  $24.996 \pm 0.1^\circ$ ,  $25.198 \pm 0.1^\circ$ ,  $25.481 \pm 0.1^\circ$ ,  $26.787 \pm 0.1^\circ$ ,  $27.285 \pm 0.1^\circ$ ,  $28.003 \pm 0.1^\circ$ , and  $29.59 \pm 0.1^\circ$ ;

the powder diffraction pattern of crystal form C comprises 10 or more  $2\theta$  values selected from the group consisting of:  $10.306 \pm 0.1^\circ$ ,  $12.666 \pm 0.1^\circ$ ,  $15.312 \pm 0.1^\circ$ ,  $17.436 \pm 0.1^\circ$ ,  $18.918 \pm 0.1^\circ$ ,  $20.748 \pm 0.1^\circ$ ,  $22.974 \pm 0.1^\circ$ ,  $24.553 \pm 0.1^\circ$ ,  $25.238 \pm 0.1^\circ$ ,  $26.241 \pm 0.1^\circ$ ,  $29.336 \pm 0.1^\circ$ ,  $32.739 \pm 0.1^\circ$ ,  $33.738 \pm 0.1^\circ$ ,  $34.118 \pm 0.1^\circ$ ,  $35.204^\circ$ .

2. The polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to claim 1, wherein the crystal form A further has one or more characteristics selected from the group consisting of:

- (1) the crystal form A has a DSC spectrum substantially as shown in Figure 1b;
- (2) the crystal form A has an infrared spectrum substantially as shown in Figure 1c;
- (3) the crystal form A has a TG spectrum substantially as shown in Figure 1d; and
- (4) the crystal form A has a Raman spectrum substantially as shown in Figure 1e.

3. The polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to claim 1, wherein the crystal form B further has one or more characteristics selected from the group consisting of:

- (1) the crystal form B has a DSC pattern substantially as shown in Figure 2b;
- (2) the crystal form B has an infrared spectrum substantially as shown in Figure 2c;

- (3) the crystal form B has a TG pattern substantially as shown in Figure 2d; and
- (4) the crystal form B has a Raman spectrum substantially as shown in Figure 2e.

4. The polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to claim 1, wherein the crystal form C further has one or more characteristics selected from the group consisting of:

- (1) the crystal form C has a DSC pattern substantially as shown in Figure 3b;
- (2) the crystal form C has an infrared spectrum substantially as shown in Figure 3c;
- (3) the crystal form C has a TG pattern substantially as shown in Figure 3d; and
- (4) the crystal form C has a Raman spectrum substantially as shown in Figure 3e.

5. A method for preparing the polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to claim 1, comprising the steps of:

(i) dissolving 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form A in an alcohol at 0 ° C to 80 ° C to form an alcohol solution containing 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride;

(ii) adding an organic solvent dropwise to the alcohol solution of step i), stirring, standing, and precipitating crystals; and

(iii) isolating and drying the precipitated crystals to obtain 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form B;

wherein said alcohol is selected from the group consisting of: methanol, ethanol, propanol, tert-butanol, butanol, octanol, pentanol, hexanol, heptanol, decanol, or a combination thereof ; the organic solvent is selected from the group consisting of: butanone, methyl tert-butyl ether, isopropyl acetate, or a combination thereof;

or the preparation method includes the steps of:

(a) dissolving 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form A in an alcohol or an alcohol-water system at 0 ° C to 80 ° C to form an alcohol solution or an alcohol-water solution containing 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride;

(b) adjusting the pH of the alcohol solution or the alcohol-water solution of step a) to be acidic with hydrochloric acid, stirring at room temperature, standing, and precipitating crystals; and

(c) separating and drying the precipitated crystals to obtain 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride crystal form C;

wherein said alcohol-water system is selected from the group consisting of methanol-water, ethanol-water, propanol-water, tert-butanol-water, butanol-water, octanol-water, pentanol-water, hexanol-water, heptanol-water or decanol-water;

wherein the crystal form A is prepared as follows:

mefurapine in free form is dissolved in an organic solvent, HCl/organic solvent is slowly added dropwise at an equivalent ratio, stirred to precipitate solids, which are filtered and dried to obtain mefurapine hydrochloride crystal form A; wherein the organic solvent is one or more of methanol, ethanol, dichloromethane, ethyl acetate, tetrahydrofuran, and acetone.

6. A pharmaceutical composition, characterized in that the composition comprises a pharmaceutically effective dose of the polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to any one of claims 1 to 4, and a pharmaceutically acceptable excipient or carrier.

7. Use of the polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-7-carboxamide hydrochloride according to any one of claims 1 to 4 or the composition according to claim 6 for preparing a drug for treating and/or preventing diseases related to poly (ADP-ribose polymerase) (PARP);

wherein the diseases related to poly (ADP-ribose polymerase) (PARP) is selected from the group consisting of tumor, inflammation, cardiovascular disease, diabetes, rheumatoid arthritis, endotoxic shock, and stroke.

8. A method of treating and/or preventing a disease related to poly (ADP-ribose polymerase) (PARP) comprising the step of administering to a subject in need thereof an effective amount of a polymorph of 2-[4-(methylaminomethyl)phenyl]-5-fluoro-benzofuran-

7-carboxamide hydrochloride according to any one of claims 1 to 4 or the composition according to claim 6;

wherein the disease related to poly (ADP-ribose polymerase) (PARP) is selected from the group consisting of tumor, inflammation, cardiovascular disease, diabetes, rheumatoid arthritis, endotoxic shock, and stroke.