[16] The manufacturing method according to [14], wherein the organic solvent is acetone.

[17] The manufacturing method according to any one of [14] to [16], wherein the metal salt is a metal salt selected from the group consisting of a sodium salt, a potassium salt, a magnesium salt and a calcium salt.

[18] The manufacturing method according to any one of [14] to [16], wherein the amino acid salt is an amino acid salt selected from the group consisting of an arginine salt, a citrulline salt, an ornithine salt and a histidine salt.

[19] The manufacturing method according to any one of [14] to [18], wherein the alcohol is ethanol or methanol.

[0020]

[20] A noncrystalline diastereomer of compound A or a salt thereof.

[20a] A purified amorphous diastereomer of compound A or a salt thereof.

[21] The noncrystalline diastereomer of compound A or a salt thereof according to [20], having a steric structure of an SR isomer in the RS notation system.

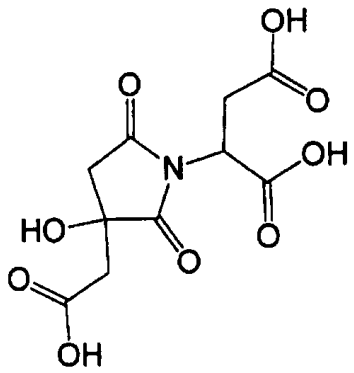
[22] The noncrystalline diastereomer of compound A or a salt thereof according to [20] or [21], wherein the salt is a metal salt or an amino acid salt of the noncrystalline diastereomer of the compound A.

[23] The noncrystalline diastereomer of compound A or a salt thereof according to [22], wherein the metal salt is a metal salt selected from the group consisting of

a sodium salt, a potassium salt, a magnesium salt and a calcium salt.

CLAIMS

1. A crystal of a compound represented by the following formula (A)(hereinafter, referred to as compound A), having peaks of diffraction angles (2θ) at 11.74 ± 0.20°, 29.25 ± 0.20°, 18.36 ± 0.20°, 21.75 ± 0.20° and 15.95 ± 0.20° in a powder X-ray diffractometric pattern using a CuKα radiation as an X-ray source:



(A)

2. A method for manufacturing a crystal of compound A, having peaks of diffraction angles (2θ) at 11.74 ± 0.20°, 29.25 ± 0.20°, 18.36 ± 0.20°, 21.75 ± 0.20° and 15.95 ± 0.20° in a powder X-ray diffractometric pattern using a CuKα radiation as an X-ray source, comprising the following steps of (a) to (f):

(a) passing an aqueous solution containing the compound A and/or a salt thereof and citric acid and/or a salt thereof and having a pH of 5.0 to 8.5 through a column packed with an anion-exchange resin;

(b) passing an eluent through the column to thereby acquire an aqueous solution containing no citric acid but containing the compound A;
(c) removing the eluent from the aqueous solution obtained by the step (b);
(d) concentrating the aqueous solution from which the eluent has been removed;
(e) adding water to the concentrated residue to make an aqueous solution, and concentrating the aqueous solution to thereby deposit a crystal of the compound A; and
(f) acquiring the crystal of the compound A.

3. The manufacturing method according to claim 2, wherein the eluent is an eluent selected from the group consisting of an ammonium acetate aqueous solution, a sodium chloride aqueous solution and an ammonium formate aqueous solution.

4. The manufacturing method according to claim 2 or 3, wherein a method of removing the eluent is a method using a column packed with a cation-exchange resin.

5. The manufacturing method according to any one of claims 2 to 4, wherein a method of the concentration is lyophilization.

6. A method for manufacturing a crystal of compound A, having peaks of diffraction angles (2θ) at 11.74 ± 0.20°, 29.25 ± 0.20°, 18.36 ± 0.20°, 21.75 ± 0.20° and 15.95 ± 0.20° in a powder X-ray diffractometric pattern using a

CuKα radiation as an X-ray source, comprising the following steps of (a) to (f):

(a) adding calcium carbonate to an aqueous solution containing the compound A and citric acid and having a pH of 2.0 or lower to thereby deposit calcium citrate;

(b) removing calcium citrate from the aqueous solution;

(c) adding sulfuric acid to the aqueous solution to make the pH to be 2.0 or lower to thereby deposit calcium sulfate;

(d) removing calcium sulfate from the aqueous solution;

(e) concentrating the aqueous solution to thereby deposit a crystal of the compound A; and

(f) acquiring the crystal of the compound A.

7. The manufacturing method according to claim 6, wherein the concentration is vacuum concentration.

8. The manufacturing method according to claim 6 or 7, further comprising, after acquiring the crystal of the compound A, the following steps of (g) to (j):

(g) adding an organic solvent to the aqueous solution to thereby deposit calcium citrate;

(h) removing calcium citrate from the mixed liquid of the aqueous solution and the organic solvent;

(i) dehydrating the mixed liquid of the aqueous solution and the organic solvent to thereby deposit a crystal of the compound A; and

(j) acquiring the crystal of the compound A.

9. The manufacturing method according to claim 8, wherein the organic solvent is acetone.

10. A method for manufacturing a noncrystalline diastereomer salt of compound A, comprising the following steps of (a) to (l):

(a) adding calcium carbonate to an aqueous solution containing the compound A and citric acid and having a pH of 2.0 or lower to thereby deposit calcium citrate;

(b) removing calcium citrate from the aqueous solution;

(c) adding sulfuric acid to the aqueous solution to make the pH to be 2.0 or lower to thereby deposit calcium sulfate;

(d) removing calcium sulfate from the aqueous solution;

(e) concentrating the aqueous solution to thereby deposit a crystal of the compound A;

(f) removing the crystal of the compound A from the aqueous solution;

(g) adding acetone as an organic solvent to the aqueous solution to thereby deposit a crystal of the compound A, and calcium citrate;

(h) removing the crystal of the compound A and calcium citrate from the mixed liquid of the aqueous solution and the organic solvent;

(i) dehydrating the mixed liquid of the aqueous solution and the organic solvent to thereby deposit a crystal of the compound A;

(j) removing the crystal of the compound A from the aqueous solution;

(k) adding a metal salt or an amino acid salt and an alcohol to the aqueous solution to thereby deposit a noncrystalline diastereomer salt of the compound A; and
(l) acquiring the noncrystalline diastereomer salt of the compound A.

11. The manufacturing method according to claim 10, wherein the metal salt is a metal salt selected from the group consisting of a sodium salt, a potassium salt, a magnesium salt and a calcium salt.

12. The manufacturing method according to claim 10, wherein the amino acid salt is an amino acid salt selected from the group consisting of an arginine salt, a citrulline salt, an ornithine salt and a histidine salt.

13. The manufacturing method according to any one of claims 10 to 12, wherein the alcohol is ethanol or methanol.

14. A purified amorphous diastereomer of compound A or a salt thereof.

15. The purified amorphous diastereomer of compound A or a salt thereof according to claim 14, wherein the salt is a metal salt or an amino acid salt of the purified amorphous diastereomer of the compound A.

16. The purified amorphous diastereomer of compound A or a salt thereof according to claim 15, wherein the metal salt

is a metal salt selected from the group consisting of a sodium salt, a potassium salt, a magnesium salt and a calcium salt.

17. The purified amorphous diastereomer of compound A or a salt thereof according to claim 15, wherein the amino acid salt is an amino acid salt selected from the group consisting of an arginine salt, a citrulline salt, an ornithine salt and a histidine salt.