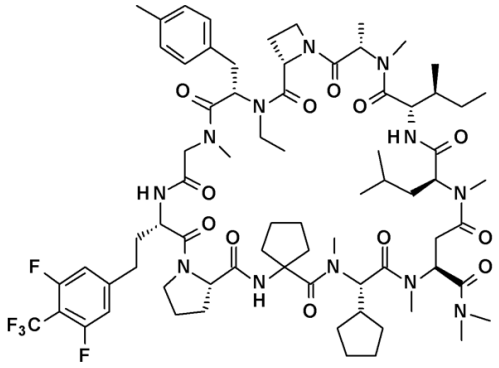
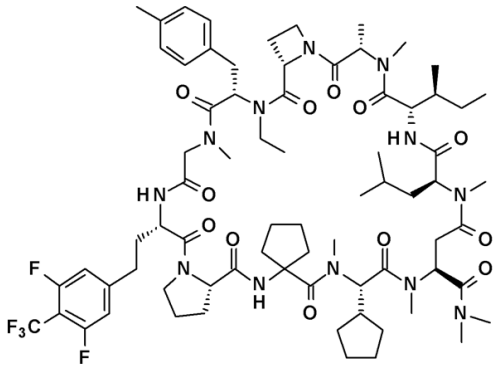
In one aspect, the present disclosure provides a crystal of a compound represented by the following formula (1):



Formula (1)

or a salt thereof, or a solvate thereof.

In another aspect, the present disclosure provides a method of producing a compound represented by the following formula (1), or a salt thereof, or a solvate thereof, by a liquid phase method, comprising linking the N-terminal amino acid residue and the C-terminal amino acid residue of a linear peptide compound by an amide bond in a solvent comprising one or more solvents selected from the group consisting of 2-MeTHF, dimethyl carbonate, anisole, isopropyl acetate, ethyl acetate, MTBE, CPME, 4-methyltetrahydropyran, heptane, toluene, acetonitrile, propionitrile, THF, 1,4-dioxane; and dimethoxyethane,

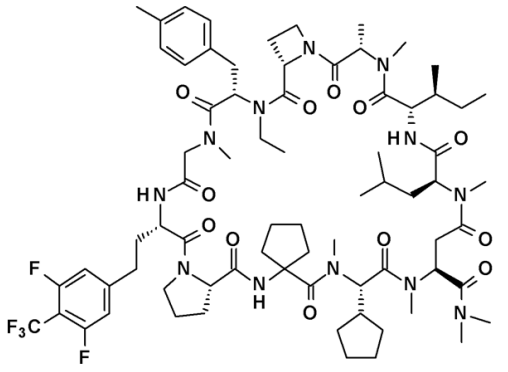


Formula (1).

In one non-limiting example, the present disclosure encompasses the following:
[1] A method for producing a cyclic peptide compound or a salt thereof, or a solvate thereof, by a liquid phase method, comprising linking the N-terminal amino acid residue and the C-terminal amino acid residue of a peptide compound in a solvent (Solvent A), which comprises one or more solvents selected from the group consisting of one or more water-immiscible solvents, one or

[CLAIMS]

1. A crystal of a compound represented by the following formula (1):



Formula (1)

or a salt thereof, or a solvate thereof.

2. The crystal of claim 1, wherein the crystal is selected from the group consisting of an unsolvate crystal, a solvate crystal, a crystal of a salt, and a solvate crystal of a salt.

3. The crystal of claim 2, wherein the crystal is a solvate crystal.

4. The crystal of claim 3, wherein the solvate crystal is a hydrate crystal.

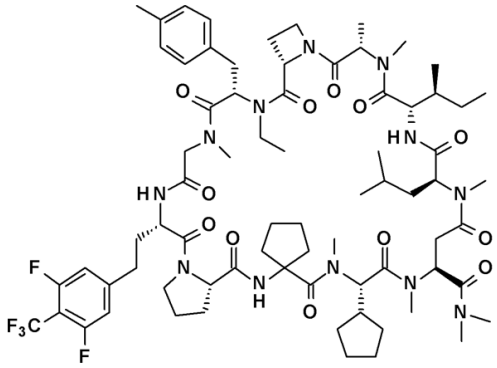
5. The crystal of claim 4, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) comprising 7 peaks selected from the group consisting of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).

6. The crystal of claim 4, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) comprising 10 peaks selected from the group consisting of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).

7. The crystal of claim 4, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).

8. A method of producing a compound represented by the following formula (1), or a salt

thereof, or a solvate thereof, by a liquid phase method, comprising linking the N-terminal amino acid residue and the C-terminal amino acid residue of a linear peptide compound by an amide bond in a solvent comprising one or more solvents selected from the group consisting of 2-MeTHF, dimethyl carbonate, anisole, isopropyl acetate, ethyl acetate, MTBE, CPME, 4-methyltetrahydropyran, heptane, toluene, acetonitrile, propionitrile, THF, 1,4-dioxane; and dimethoxyethane,

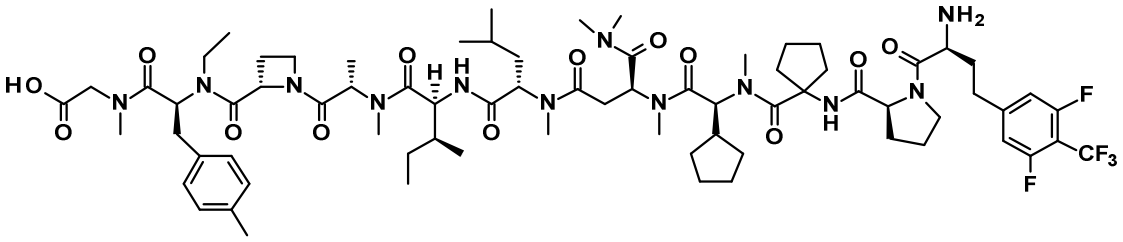


Formula (1).

9. The method of claim 8, wherein either or both of the C-terminal amino acid residue and the N-terminal amino acid residue of the linear peptide compound are amino acid residues that do not have an asymmetric carbon at the α-carbon of the carboxyl group.

10. The method of claim 9, wherein the C-terminal amino acid residue of the linear peptide compound is an amino acid residue that does not have an asymmetric carbon at the α-carbon of the carboxyl group.

11. The method of claim 10, wherein the linear peptide compound is:



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12. The method of claim 11, wherein the compound represented by the formula (1) or salt thereof, or solvate thereof, is a solvate of the compound represented by the formula (1).

13. The method of claim 12, wherein the solvate of the compound represented by the formula (1) is a hydrate of the compound represented by the formula (1).

14. The method of claim 11, wherein the compound represented by the formula (1) or salt thereof, or solvate thereof, is a compound represented by the formula (1).

15. The method of claim 8, wherein the compound represented by the formula (1) or salt thereof, or solvate thereof, is a solvate of the compound represented by the formula (1).

16. The method of claim 15, wherein the solvate of the compound represented by the formula (1) is a hydrate of the compound represented by the formula (1).

17. The method of claim 8, wherein the compound represented by the formula (1) or salt thereof, or solvate thereof, is a compound represented by the formula (1).

18. The method of claim 8, wherein the solvent comprises one or more solvents selected from the group consisting of 2-MeTHF, THF, 4-methyltetrahydropyran, MTBE, CPME, dimethyl carbonate, ethyl acetate, isopropyl acetate, anisole, MeCN, heptane, and toluene.

19. The method of any one of claims 8 to 18, further comprising isolating and/or purifying the compound represented by the formula (1) or salt thereof, or solvate thereof, by crystallization to obtain a crystal of the compound represented by the formula (1) or salt thereof, or solvate thereof.

20. The method of claim 19, wherein the crystal of the compound represented by the formula (1) or salt thereof, or solvate thereof, is an unsolvate crystal or solvate crystal of the compound represented by the formula (1).

21. The method of claim 20, wherein the unsolvate crystal or solvate crystal of the compound represented by the formula (1) is a solvate crystal of the compound represented by the formula (1).

22. The method of claim 21, wherein the solvate crystal of the compound represented by the formula (1) is a hydrate crystal.

23. The method of claim 22, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) comprising 7 peaks selected from the group consisting of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).

24. The method of claim 22, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) comprising 10 peaks selected from the group consisting of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).

25. The method of claim 22, wherein the hydrate crystal is a Form C crystal characterized by powder X-ray diffraction peaks at diffraction angles (2θ values) of 4.964°, 7.921°, 8.296°, 8.855°, 9.956°, 10.435°, 11.729°, 12.704°, 13.552°, 13.901°, 15.895°, 16.643°, and 17.813° (±0.2°).