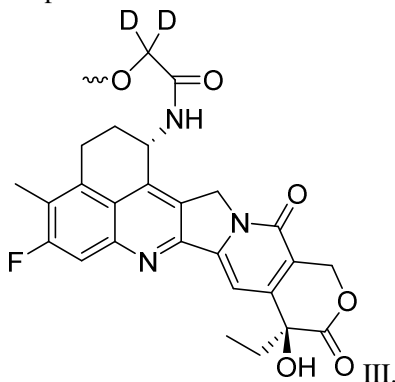


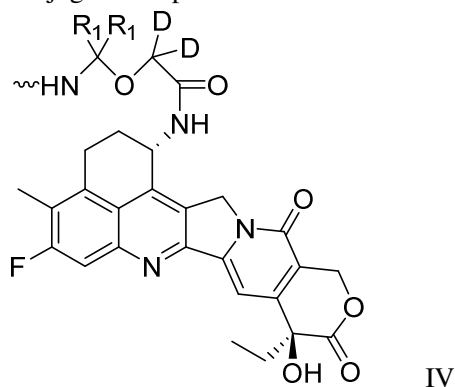
CLAIMS

1. An antibody-drug conjugate of general formula $\text{Ab}-(\text{L}-\text{U})_n$, or a pharmaceutically acceptable salt or a solvate thereof, wherein Ab represents an antibody moiety, L represents a linker moiety, U represents a cytotoxic drug moiety, and n is an integer or a decimal selected from the group consisting of 1 to 10, wherein the U is a camptothecin topoisomerase I inhibitor, and the L moiety and/or the U moiety has a deuterated modification, and

wherein the antibody-drug conjugate comprises a structure of formula III below:

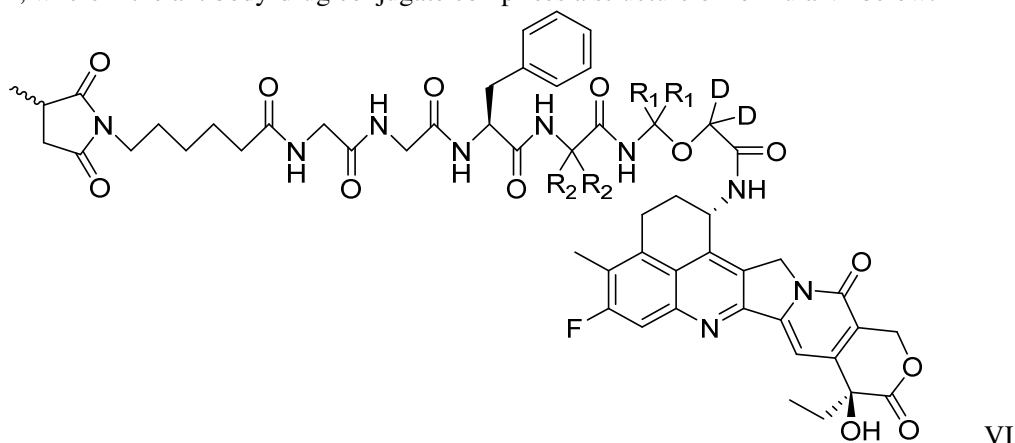


2. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 1, wherein the antibody-drug conjugate comprises a structure of formula IV below:



in the formula IV, R_1 is selected from the group consisting of hydrogen (H) and deuterium (D).

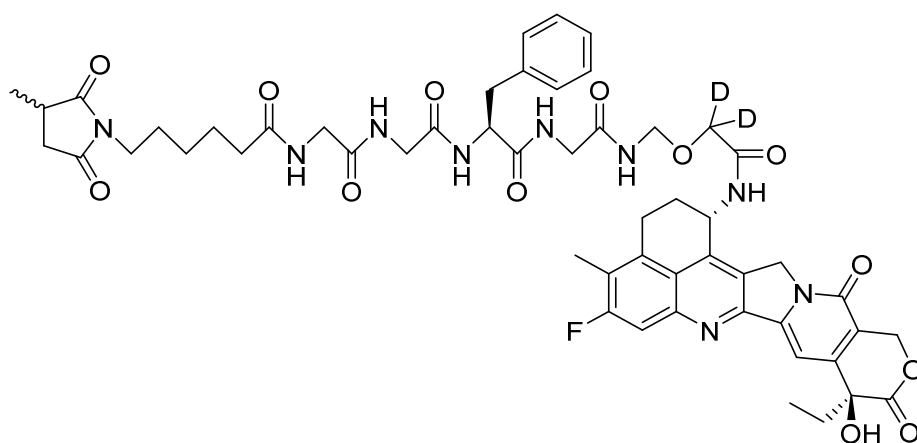
3. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 1 or 2, wherein the antibody-drug conjugate comprises a structure of formula VI below:



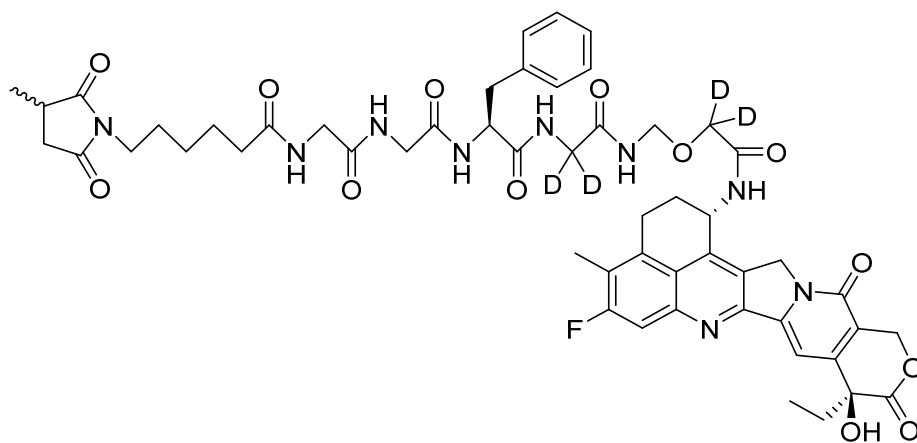
wherein R_1 and R_2 are each independently selected from the group consisting of hydrogen (H) and deuterium (D).

4. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 3, wherein the structure of formula VI is linked to the antibody moiety by the left succinimide terminus.

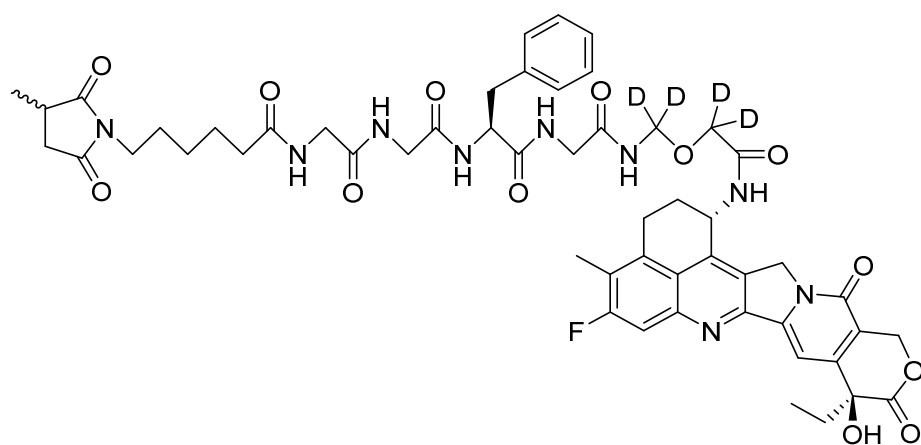
5. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 3 or 4, wherein the formula VI is of a structure of VI-1, VI-2, VI-3, or VI-4 below:



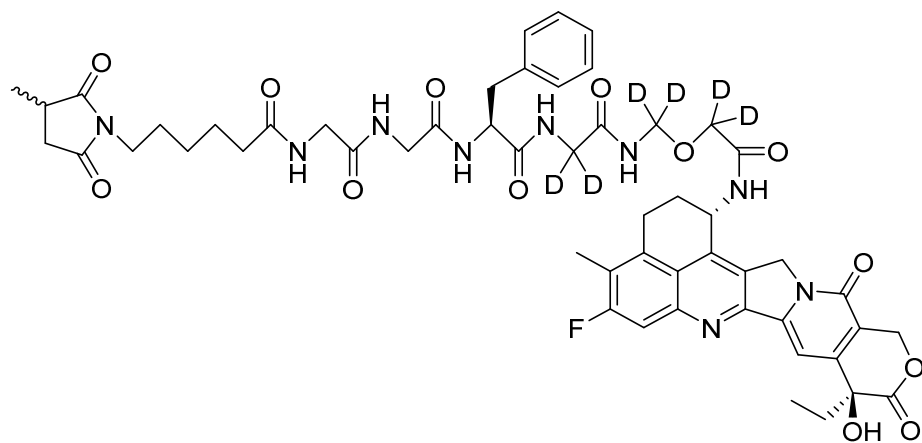
VI-1



VI-2

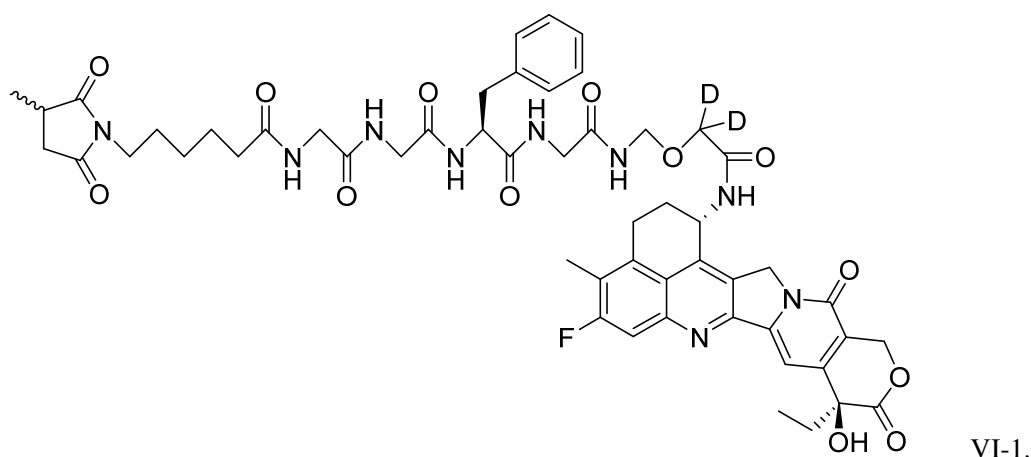


VI-3, or



VI-4.

6. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 5, wherein the formula VI is of a structure of VI-1 below:



7. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 1-6, wherein the Ab is an antibody capable of specifically binding to HER2.

8. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 7, wherein the Ab comprises a first antigen-binding fragment that is monovalent and specifically binds to an ECD4 epitope of HER2 on an HER2-expressing cell, wherein the first antigen-binding fragment is an scFv, and comprises a heavy chain CDR1, a heavy chain CDR2, a heavy chain CDR3, a light chain CDR1, a light chain CDR2 and a light chain CDR3, the heavy chain CDR1, the heavy chain CDR2 and the heavy chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 43, 28 and 29, respectively, and the light chain CDR1, the light chain CDR2 and the light chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 30, 31 and 32, respectively.

9. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 8, wherein the first antigen-binding fragment comprises a heavy chain variable region and a light chain variable region, the heavy chain variable region comprising amino acid sequence set forth in SEQ ID No:35, and the light chain variable region comprising amino acid sequence set forth in SEQ ID No:36.

10. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 9, wherein a VH and VL of the first antigen-binding fragment is arranged from N-terminus to C-terminus in the following order: VH-linker-VL.

11. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claims 7-10, wherein the antibody moiety Ab further comprises a second antigen-binding fragment that is monovalent and specifically binds to an ECD2 epitope of HER2 on an HER2-expressing cell, and the second antigen-binding fragment is an Fab.

12. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 11, wherein the second antigen-binding fragment comprises a heavy chain CDR1, a heavy chain CDR2, a heavy chain CDR3, a light chain CDR1, a light chain CDR2 and a light chain CDR3, the heavy chain CDR1, the heavy chain CDR2 and the heavy chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 45, 46 and 47, respectively, and the light chain CDR1, the light chain CDR2 and the light chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 48, 49 and 50, respectively.

13. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 11-12, wherein the second antigen-binding fragment comprises a heavy chain variable region and a light chain variable region comprising amino acid sequences set forth in SEQ ID NOs: 37 and 38, respectively.

14. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 7-13, wherein the antibody moiety Ab comprises an immunoglobulin functional domain operably linked to the first antigen-binding fragment and/or the second antigen-binding fragment, the immunoglobulin functional domain comprising: i. one or more of CL, CH1, CH2 or CH3, or ii. an Fc.

15. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 14, wherein the CL, CH1, CH2, CH3 and Fc are derived from CL, CH1, CH2, CH3 and Fc of human IgG, respectively.

16. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 15, wherein the CL, CH1, CH2, CH3 or Fc has a modification or does not have a modification.

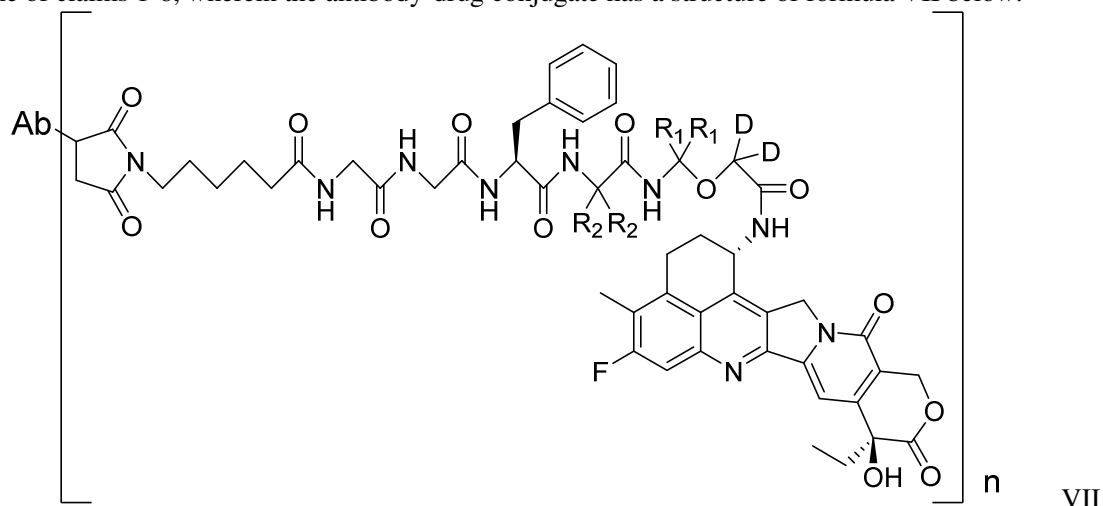
17. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 16, wherein the CH3 or Fc has a modification that is an amino acid substitution at position 435 or/and position 436 according to the Kabat numbering system.

18. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 14-16, wherein the Fc is derived from human IgG1 or IgG4.

19. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 14-17, wherein the Fc is a dimeric Fc comprising a first Fc polypeptide and a second Fc polypeptide, the first antigen-binding fragment is operably linked to the first Fc polypeptide, and the second antigen-binding fragment is operably linked to the second Fc polypeptide.

20. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 7-19, wherein the antibody moiety Ab is a bivalent bispecific antibody, comprising: a heavy chain set forth in SEQ ID NO: 11, a heavy chain set forth in SEQ ID NO: 13, and a light chain set forth in SEQ ID NO: 15.

21. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 1-6, wherein the antibody-drug conjugate has a structure of formula VII below:

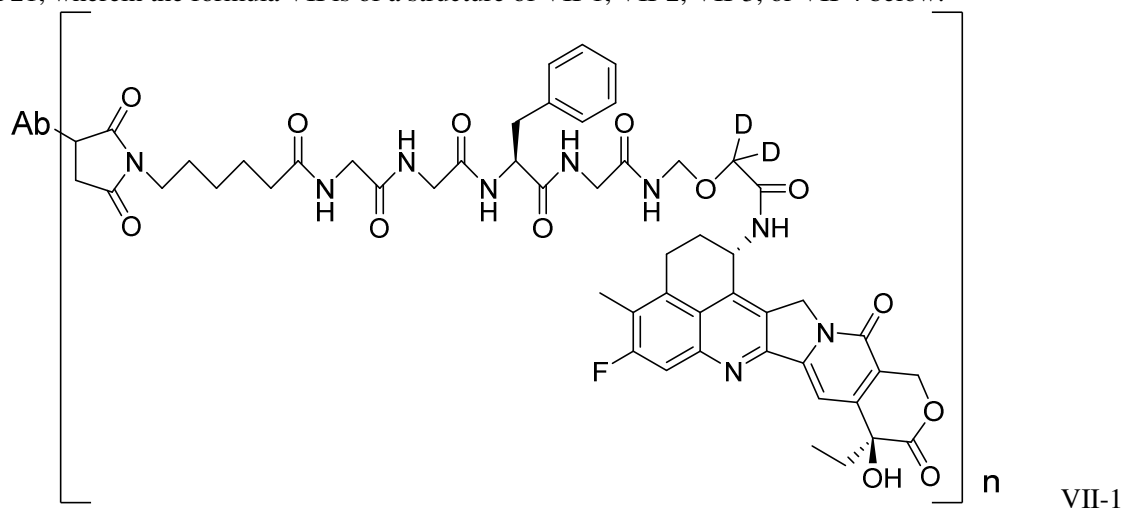


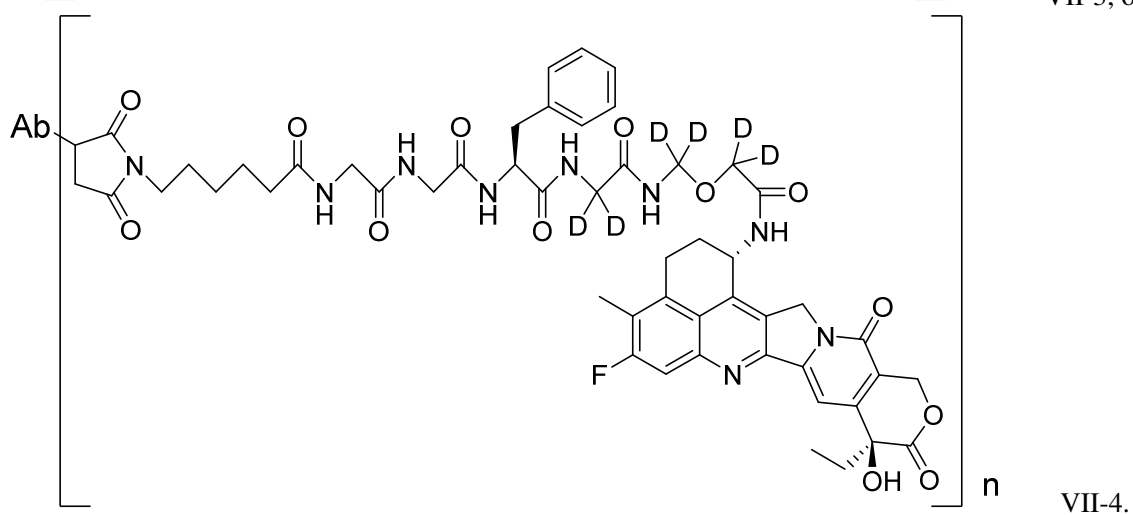
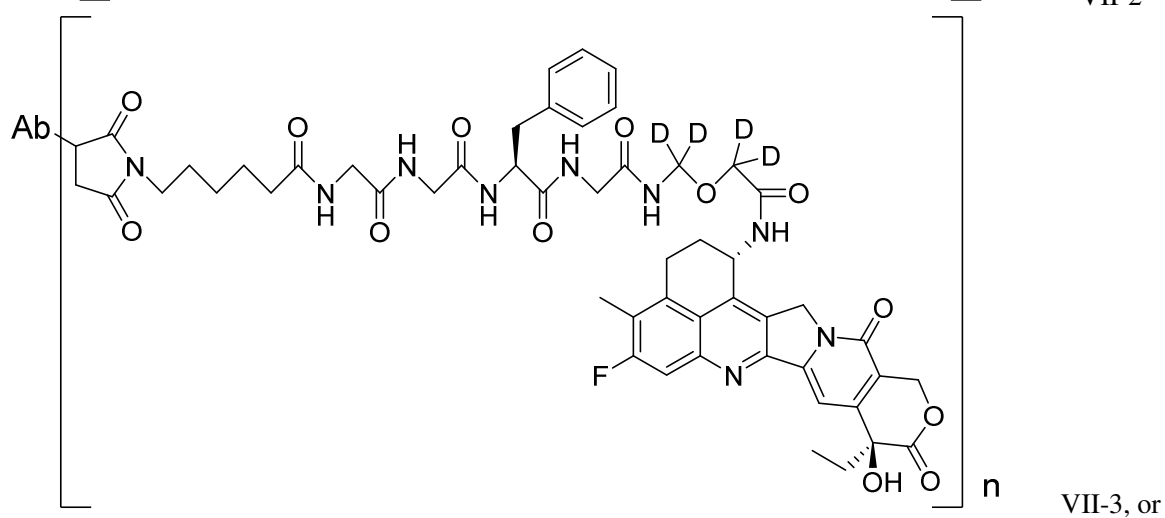
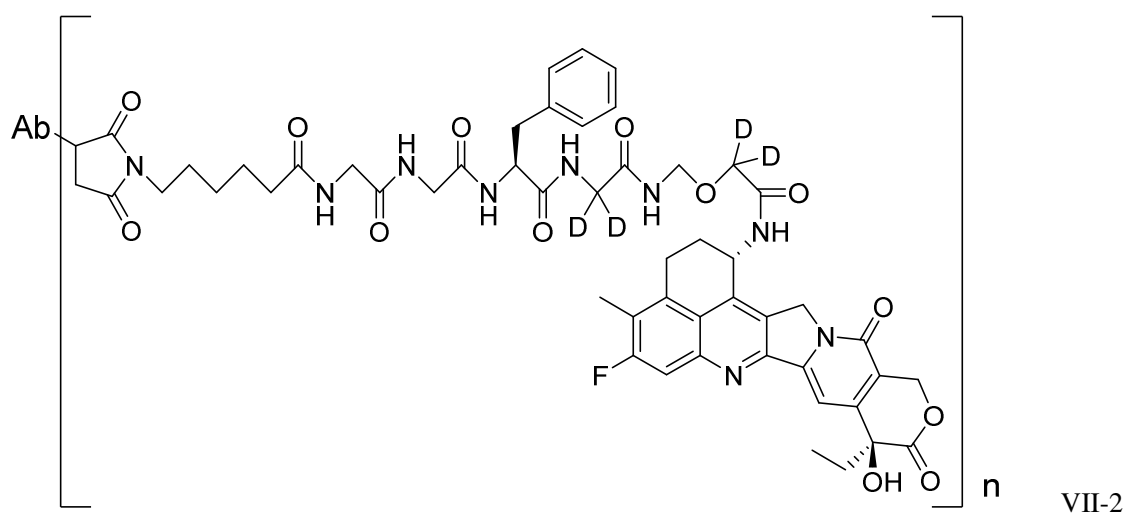
wherein the Ab represents an antibody moiety comprising a first antigen-binding fragment and a second antigen-binding fragment, wherein the first antigen-binding fragment is an scFv and comprises a heavy chain CDR1, a heavy chain CDR2, a heavy chain CDR3, a light chain CDR1, a light chain CDR2 and a light chain CDR3, the heavy chain CDR1, the heavy chain CDR2 and the heavy chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 43, 28 and 29, respectively, and the light chain CDR1, the light chain CDR2 and the light chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 30, 31 and 32, respectively, the second antigen-binding fragment is an Fab and comprises a heavy chain CDR1, a heavy chain CDR2, a heavy chain CDR3, a light chain CDR1, a light chain CDR2 and a light chain CDR3, the heavy chain CDR1, the heavy chain CDR2 and the heavy chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 45, 46 and 47, respectively, and the light chain CDR1, the light chain CDR2 and the light chain CDR3 comprising amino acid sequences set forth in SEQ ID NOs: 48, 49 and 50, respectively,

n is an integer or a decimal selected from the group consisting of 1 to 10, and

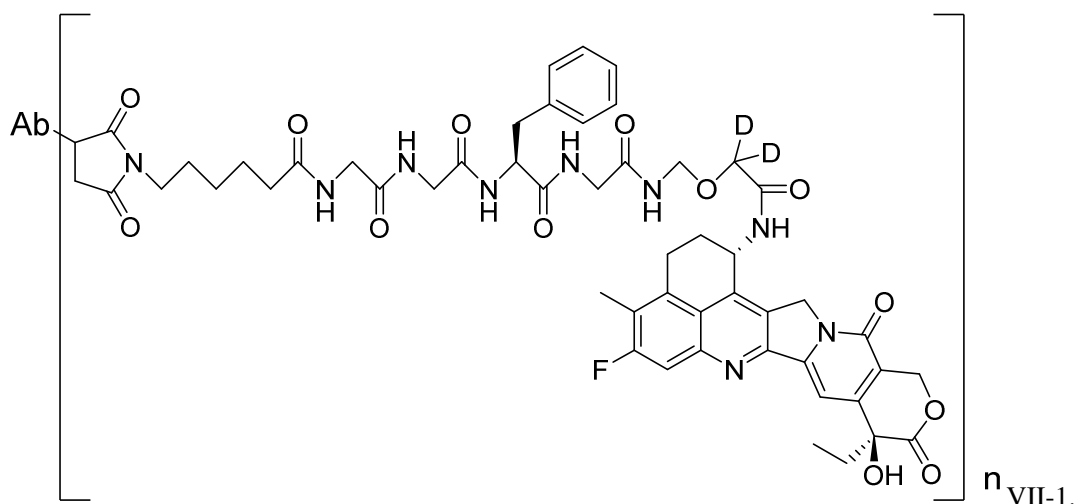
R₁ and R₂ are each independently selected from the group consisting of hydrogen (H) and deuterium (D).

22. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 21, wherein the formula VII is of a structure of VII-1, VII-2, VII-3, or VII-4 below:





23. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 21, wherein the formula VII is of a structure of VII-1 below:



24. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 21-23, wherein the first antigen-binding fragment comprises a heavy chain variable region and a light chain variable region, the heavy chain variable region comprising amino acid sequence set forth in SEQ ID No:35, and the light chain variable region comprising amino acid sequence set forth in SEQ ID No:36; the second antigen-binding fragment comprises a heavy chain variable region and a light chain variable region comprising amino acid sequences set forth in SEQ ID NOs: 37 and 38, respectively.

25. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 21-24, wherein the antibody moiety Ab is a bivalent bispecific antibody, comprising: a heavy chain set forth in SEQ ID NO: 11, a heavy chain set forth in SEQ ID NO: 13, and a light chain set forth in SEQ ID NO: 15.

26. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 1-25, wherein n is an integer or a decimal selected from the group consisting of 3 to 8.

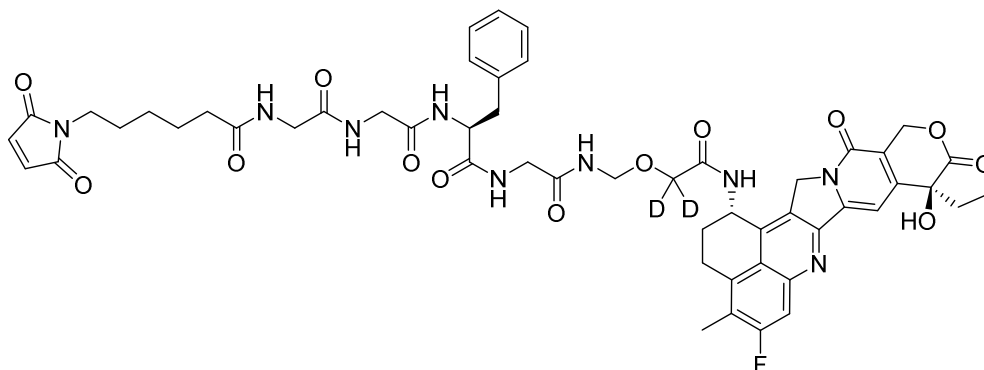
27. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to claim 26, wherein n is an integer or a decimal selected from the group consisting of 5 to 8.

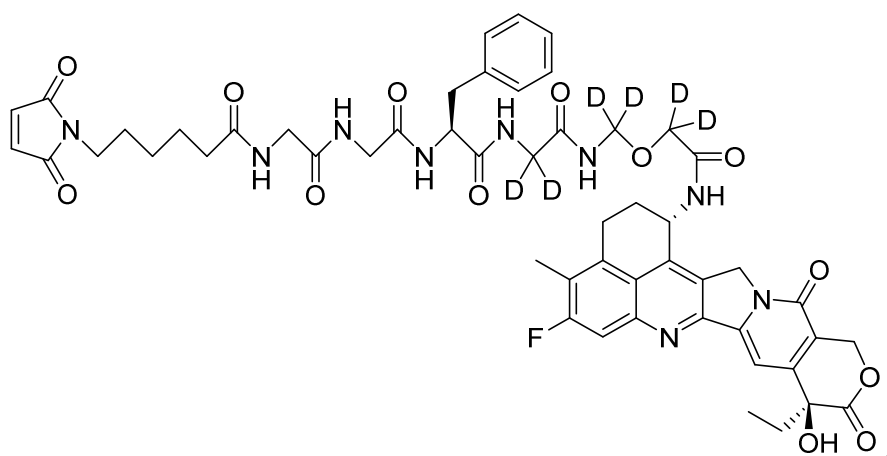
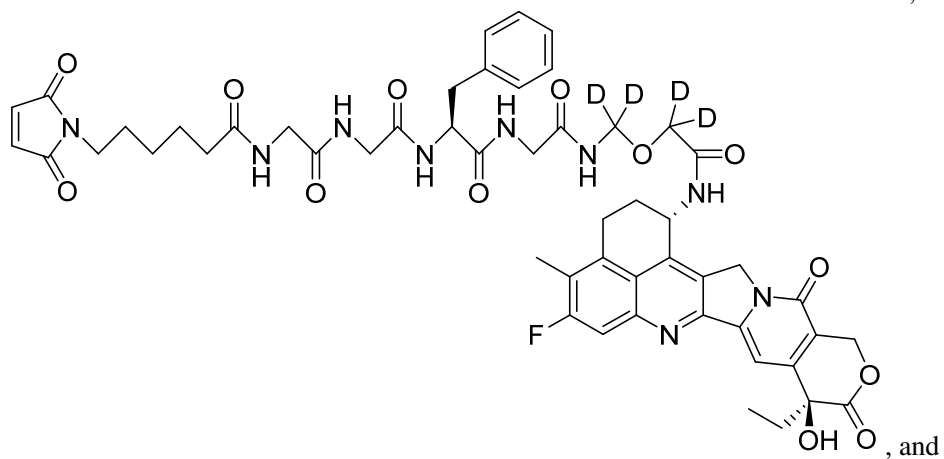
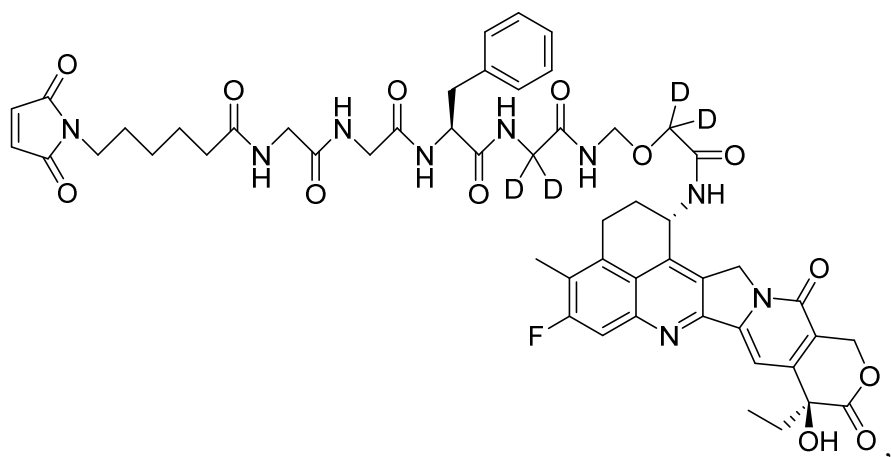
28. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof according to any one of claims 1-27 for use in preventing and treating cancer.

29. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof for use according to claim 28, wherein the cancer is HER2 positive cancer, HER2 negative cancer, and cancer that shows HER2 expression as IHC2+ detected by immunohistochemical assay.

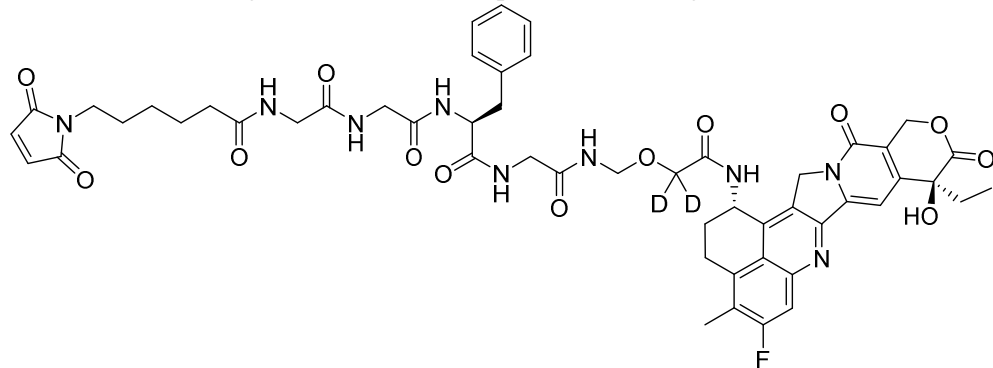
30. The antibody-drug conjugate, or the pharmaceutically acceptable salt or the solvate thereof for use according to claim 28 or 29, wherein the cancer is breast cancer.

31. A linker-drug intermediate compound selected from:





32. The linker-drug intermediate compound according to claim 31, wherein the compound is



33. A compound having a structure of formula IV(a) below:

wherein R₁ is selected from the group consisting of hydrogen (H) and deuterium (D).

III(a).