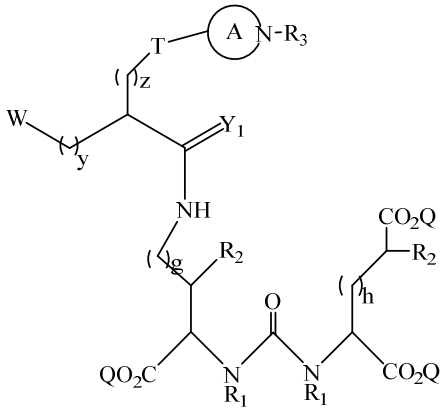
CLAIMS

1. A compound represented by formula (IV) or a pharmaceutically acceptable salt thereof,



(IV)

wherein:

Q is selected from the group consisting of H and a protecting group, preferably from H;

R_1 and R_2 are each independently selected from the group consisting of H and C_{1-4} alkyl and are preferably both H; the C_{1-4} alkyl is optionally substituted with one or more substituents P or is unsubstituted;

each occurrence of Q, R_1, and R_2 may be the same or different;

Y_1 is S or O, preferably O;

T is selected from the group consisting of $-NR_4(CO)-$, $-NR_4(SO_2)-$, and $-NR_4(CH_2)-$;

R_4 is selected from the group consisting of H, C_{1-6} alkyl, 6-10 membered aryl, and 5-12 membered heteroaryl; the C_{1-6} alkyl, 6-10 membered aryl, or 5-12 membered heteroaryl is optionally substituted with one or more substituents P or is unsubstituted;

ring A is a 5-12 membered nitrogen-containing spiroheterocyclyl group;

W is selected from the group consisting of 6-10 membered aryl and 5-12 membered heteroaryl; the 6-10 membered aryl or 5-12 membered heteroaryl is optionally substituted with one or more substituents P or is unsubstituted;

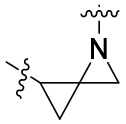
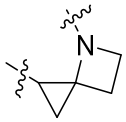
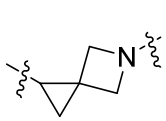
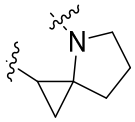
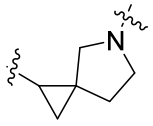
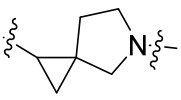
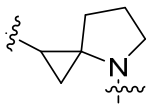
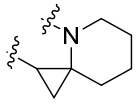
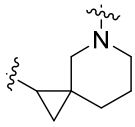
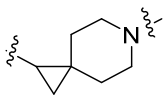
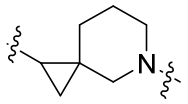
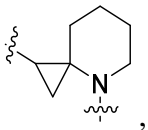
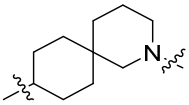
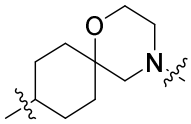
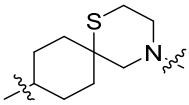
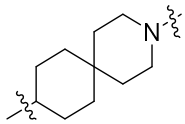
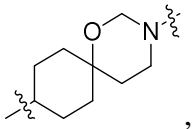
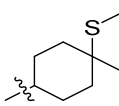
the substituents P are selected from the group consisting of C_1-C_6 alkyl, halogen, deuterium, hydroxy, sulfhydryl, $-NR_iR_j$, oxo, thio, $-C(O)R_k$, $-C(O)OR_k$, $-S(O)R_k$, $-S(O)OR_k$, $-S(O)(O)R_k$, $-S(O)(O)OR_k$, $-C(S)R_k$, nitro, cyano, C_1-C_6 alkoxy, C_1-C_6 alkylthioether group, C_2-C_6 alkenyl, C_2-C_6 alkynyl, 3- to 10-membered cycloalkyl, 3- to 10-membered heterocyclyl, 6- to 10-membered aryl, 5- to 10-membered heteroaryl, 8- to 12-membered fused cycloaryl, and 5- to 12-membered fused heteroaryl;

R_i and R_j are each independently selected from the group consisting of a hydrogen atom, hydroxy, C_1-C_6 alkyl, and C_1-C_6 alkoxy; R_k is independently selected from the group consisting of a hydrogen atom, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, hydroxy, and $-NR_iR_j$, wherein the alkyl, alkoxy, or haloalkyl is optionally substituted with one or more substituents selected from the group consisting of C_1-C_6 alkyl, halogen, hydrogen, sulfhydryl, $-NR_iR_j$, oxo, thio,

carboxyl, nitro, cyano, C_1-C_6 alkoxy, C_1-C_6 alkylthioether group, C_2-C_6 alkenyl, C_2-C_6 alkynyl, 3- to 10-membered cycloalkyl, 3- to 10-membered heterocyclyl, 6- to 10-membered aryl, and 5- to 10-membered heteroaryl;

y, z, g, and h are each independently integers of 0-6;

R_3 is selected from the group consisting of H and a chelating agent.

2. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to claim 1, wherein T is -NH(CO)-; ring A is a 5-12 membered nitrogen-containing monospiroheterocyclyl group, more preferably a 3-membered/4-membered, 3-membered/5-membered, 3-membered/6-membered, 4-membered/4-membered, 4-membered/5-membered, 4-membered/6-membered, 5-membered/5-membered, 5-membered/6-membered, or 6-membered/6-membered nitrogen-containing monospiroheterocyclyl group, most preferably , , , , , , , , , , , , , , , , , , , .

3. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 2, wherein W is selected from 6-10 membered aryl, preferably naphthyl.

4. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 3, wherein Y_1 is O.

5. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 4, wherein R_1 and R_2 are each independently H.

6. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof

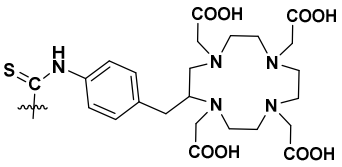
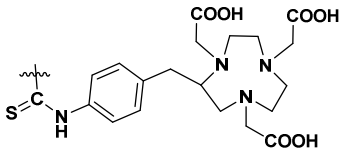
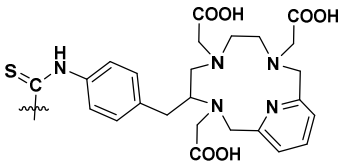
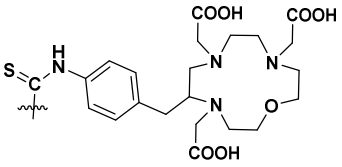
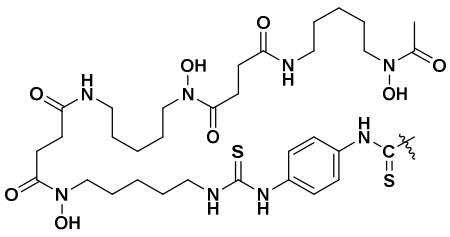
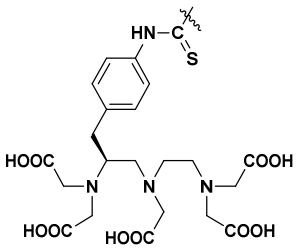
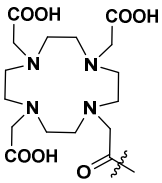
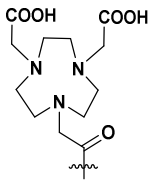
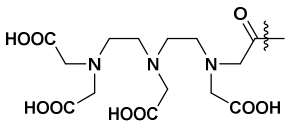
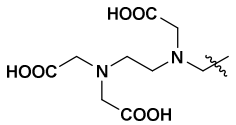
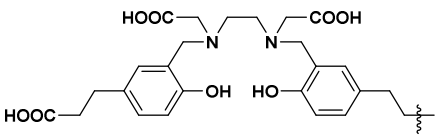
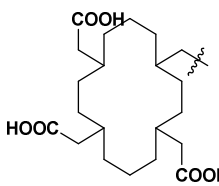
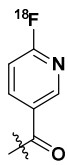
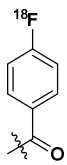
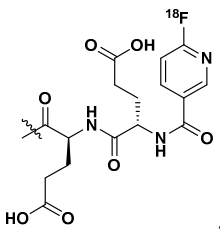
according to any of claims 1 to 5, wherein Q is selected from the group consisting of H and a protecting group, preferably from H.

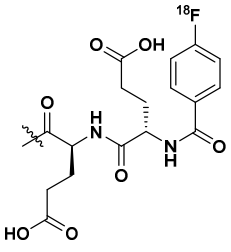
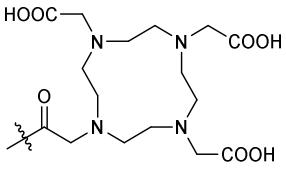
7. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 6, wherein y and h are each independently selected from the group consisting of 0, 1, and 2, preferably from 1.

8. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 6, wherein g is selected from the group consisting of 3 and 4, preferably from 3.

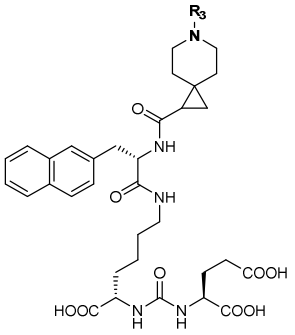
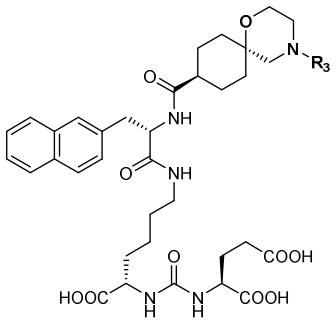
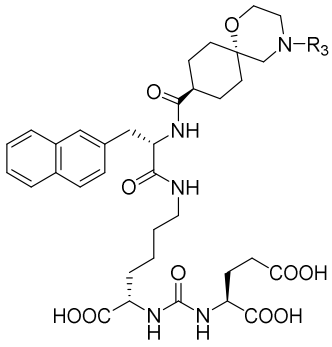
9. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 6, wherein z is selected from the group consisting of 0 and 1, preferably from 0.

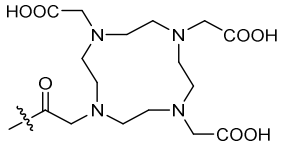
10. The compound represented by formula (IV) or the pharmaceutically acceptable salts thereof according to claims 1 to 9, wherein the chelating agent is selected from the group consisting of:


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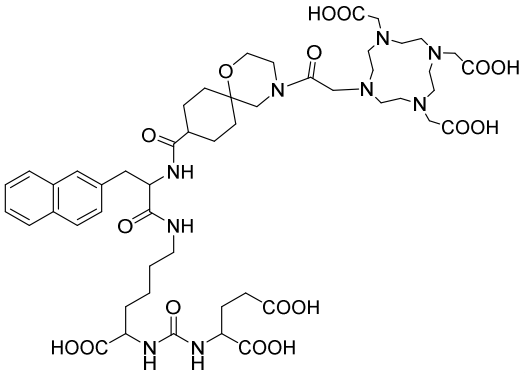
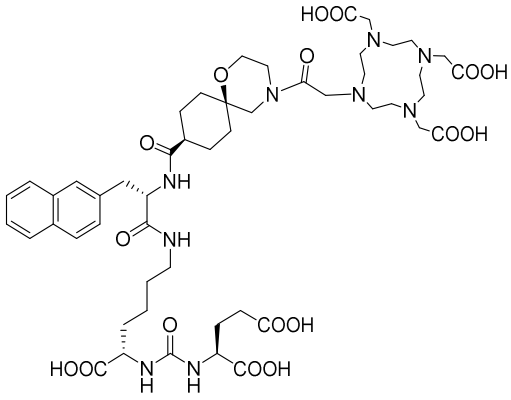

; preferably from .

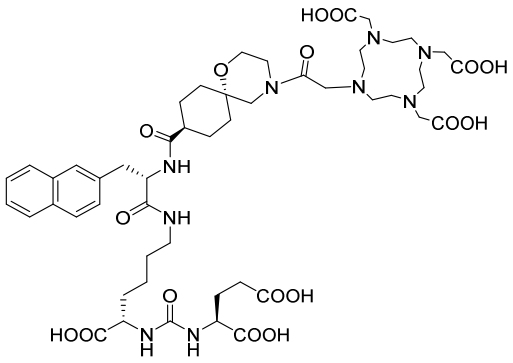
11. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to claims 1 to 10, being selected from the group consisting of:


, 
, and 
, or the pharmaceutically acceptable salt thereof,

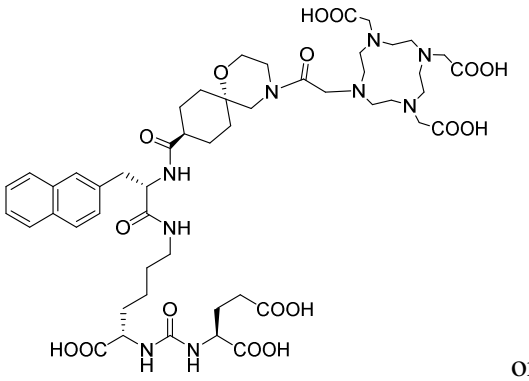
wherein R_3 is selected from the group consisting of H and .

12. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 11, being


, preferably 
or



, and most preferably

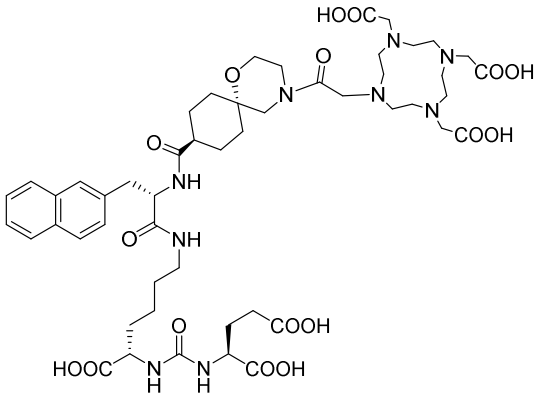


or the pharmaceutically acceptable salt thereof.

13. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 12, wherein the chelating agent comprises a radionuclide.

14. The compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to claim 13, wherein the radionuclide is selected from at least one of ^{18}F, ^{11}C, ^{68}Ga, ^{124}I, ^{89}Zr, ^{64}Cu, ^{86}Y, ^{99m}Tc, ^{111}In, ^{123}I, ^{90}Y, ^{125}I, ^{131}I, ^{177}Lu, ^{211}At, ^{153}Sm, ^{186}Re, ^{188}Re, ^{67}Cu, ^{212}Pb, ^{225}Ac, ^{213}Bi, ^{212}Bi, ^{212}Pb, and ^{67}Ga, preferably from the group consisting of ^{68}Ga and ^{177}Lu.

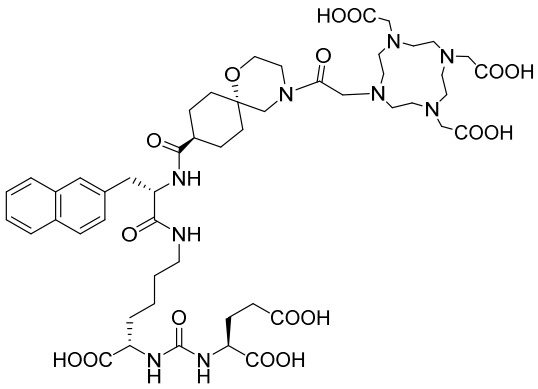
15. The compound represented by formula (IV) or a pharmaceutically acceptable salt thereof, according to claim 14, being



, wherein the chelating agent comprises a radionuclide, and the radionuclide is ^{68}Ga.

16. The compound represented by formula (IV) or a pharmaceutically acceptable salt thereof,

according to claim 14, being



, wherein the chelating agent comprises a radionuclide, and the radionuclide is ^{177}Lu.

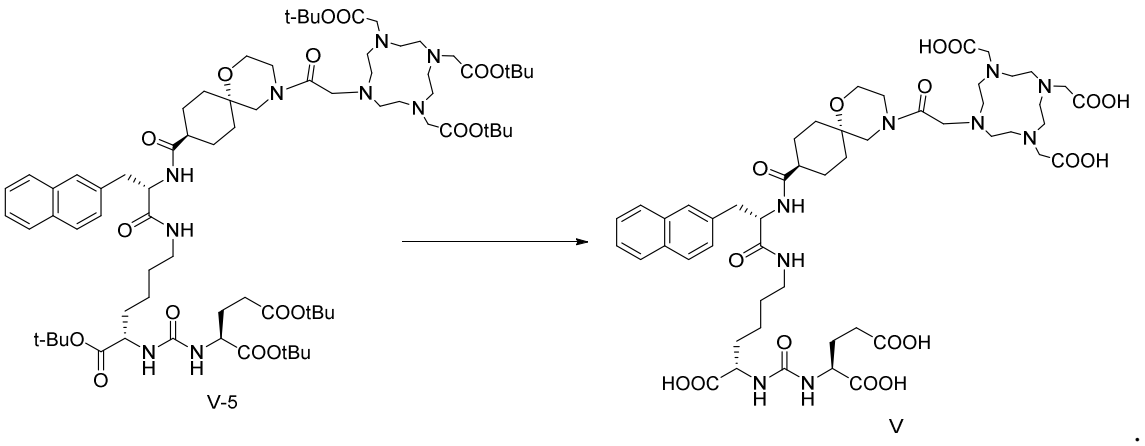
17. A pharmaceutical composition, comprising the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 1 to 12, and one or more pharmaceutically acceptable excipients, diluents, or carriers.

18. A pharmaceutical composition, comprising the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 13 to 16, and one or more pharmaceutically acceptable excipients, diluents, or carriers.

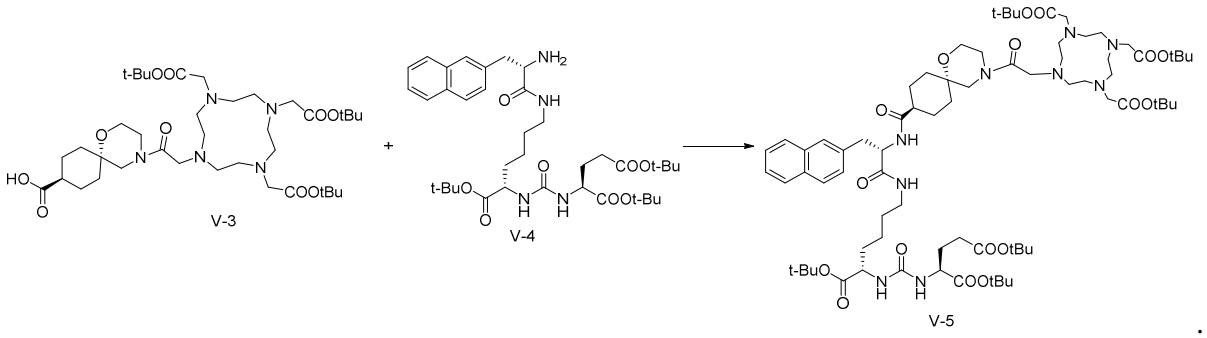
19. Use of the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 13 to 16 or the composition according to claim 18 in the preparation of a composition for imaging in patients.

20. Use of the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claims 13 to 16 or the composition according to claim 18 in the preparation of a medicament for diagnosing and/or treating and/or preventing a tumor and a cancer, wherein preferably, the tumor and the cancer are prostate cancer.

21. A preparation method for a compound represented by formula (IV) or a pharmaceutically acceptable salt thereof, wherein the compound represented by formula (IV) is the compound represented by formula v or a pharmaceutically acceptable salt thereof; the preparation method comprises the step of removing tert-butyl groups from the compound represented by formula v-5:



22. The preparation method according to claim 21, further comprising the step of conducting a condensation reaction of the compound represented by formula v-3 with the compound represented by formula v-4 to give the compound represented by formula v-5,



23. A preparation method for the compound according to any of claims 13 to 16, comprising the step of preparing the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof according to any of claim 21 or 22, and further comprising the step of complexing the chelating agent in the compound represented by formula (IV) or the pharmaceutically acceptable salt thereof with the radionuclide.