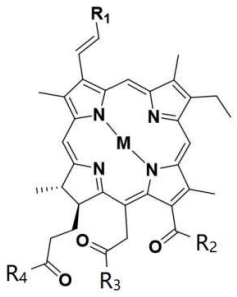
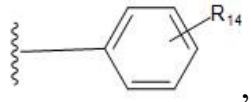
WHAT IS CLAIMED IS:

1. A chlorin derivative or a pharmaceutically acceptable salt thereof having a structure represented by following formula (I):

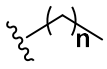


(I)

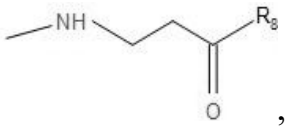
wherein,

R_1 is 

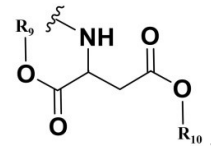
, wherein R_{14} is -H, C_1-C_6 alkoxy or C_1-C_4 haloalkyl; or

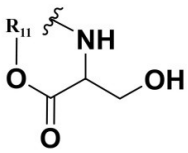


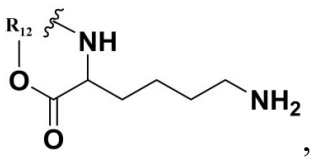
, wherein n is any integer from 2 to 7;

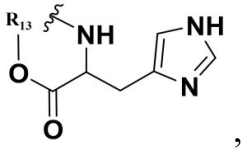
R_2 is 

, C_1-C_6 alkoxy or -OH, wherein R_8 is any of the following groups:

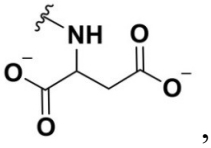


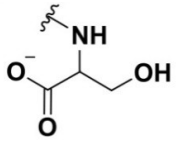
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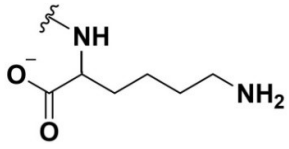
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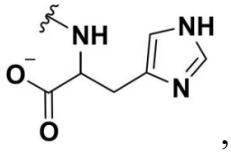
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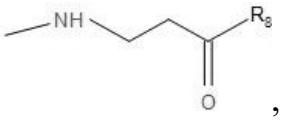
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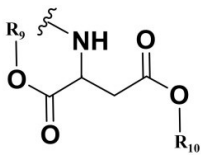
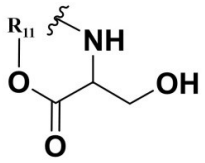
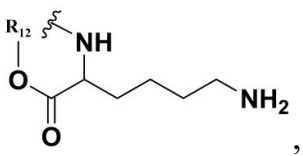
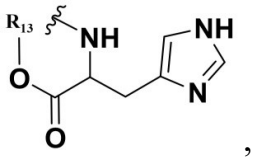
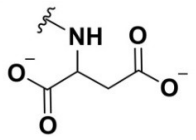
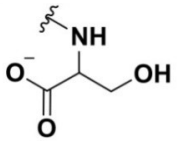
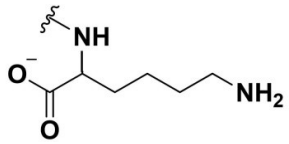
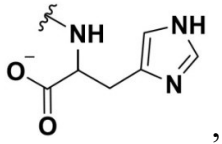
wherein R_9, R_{10}, R_{11}, R_{12} and R_{13} may be the same or different, and are each independently selected from C_1-C_6 alkyl, and

when R_2 is 

, R_3 and R_4 are each independently

selected from C_1-C_6 alkoxy or -OH;

when R_2 is C_1-C_6 alkoxy or -OH, one of R_3 and R_4 is any of the following groups:

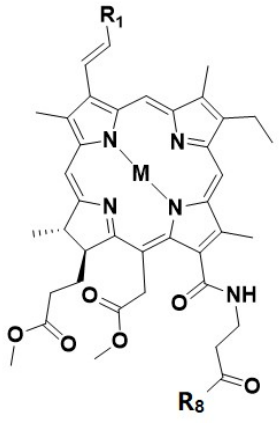
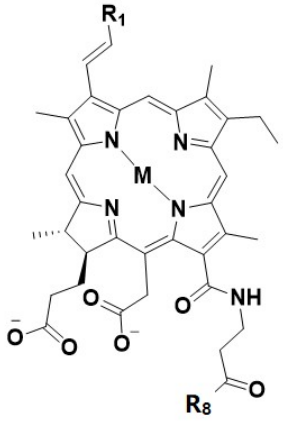









wherein R_9, R_{10}, R_{11}, R_{12} and R_{13} are defined as above, and

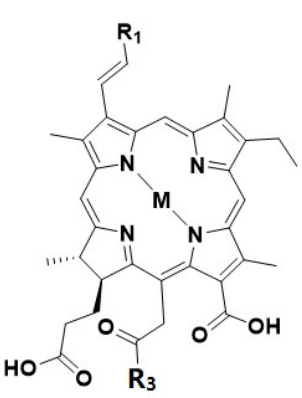
the other of R_3 and R_4 is C_1-C_6 alkoxy or -OH; and

M is 2H or a metal ion, for example, a divalent metal ion such as Cu^{2+}, Fe^{2+}, Zn^{2+}, Mg^{2+}, Ni^{2+}, Co^{2+}, Pt^{2+} or Pd^{2+}; or a tetravalent metal ion such as Sn^{4+} or Ti^{4+}.

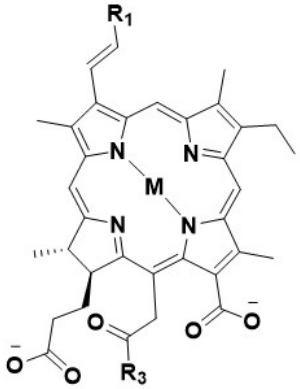
2. The chlorin derivative or the pharmaceutically acceptable salt thereof according to claim 1, wherein the chlorin derivative or the pharmaceutically acceptable salt thereof is:

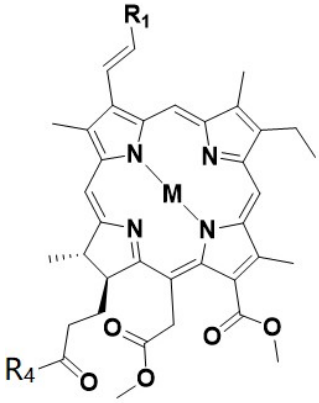
(IIa) (IIb)



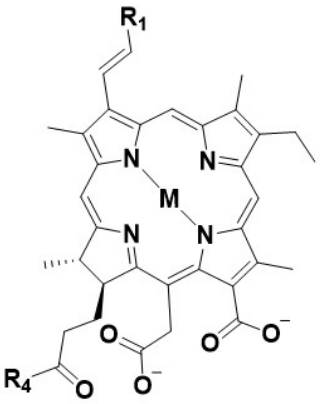
(IIIa)



(IIIb)

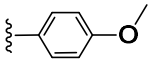
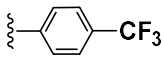


or

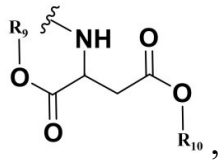


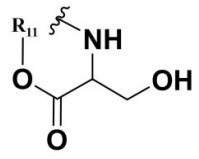
(IVa) (IVb)

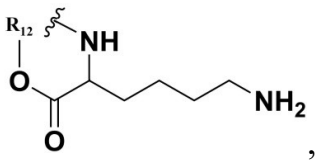
wherein,

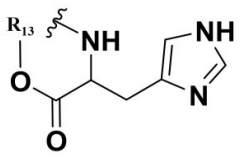
R_1 is , , , or , wherein n is any integer from 2-7;

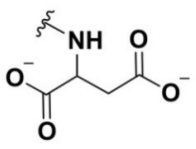
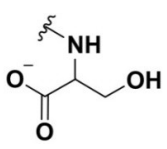
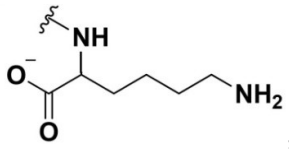
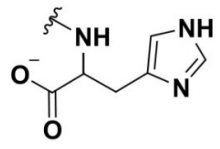
R_3, R_4, and R_8 are any one of the following groups:







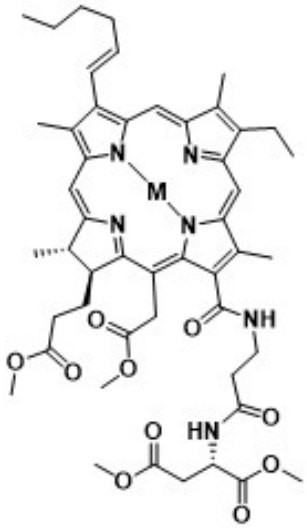
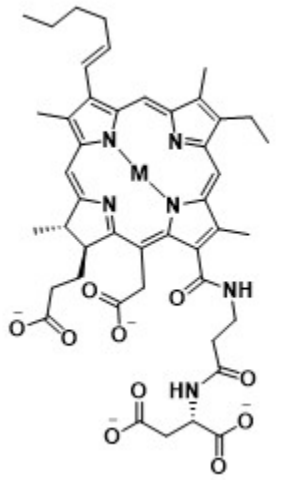


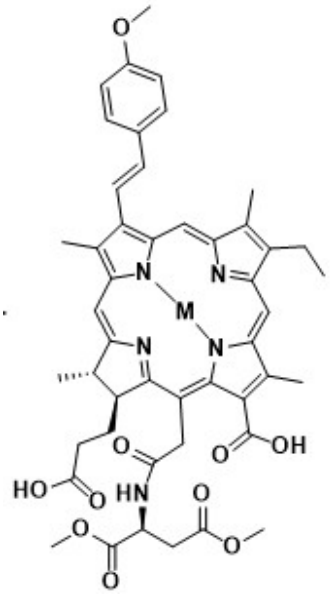
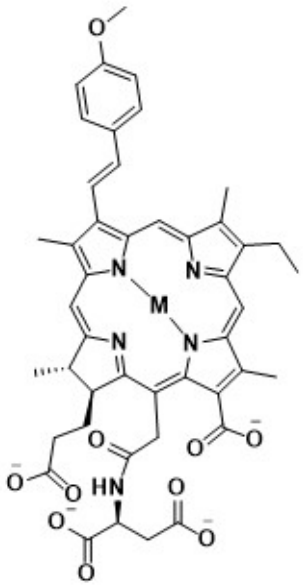



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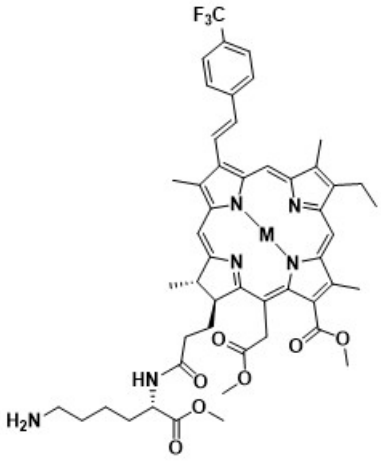
wherein R_9, R_{10}, R_{11}, R_{12} and R_{13} are defined as in claim 1; and

M is defined as in claim 1.

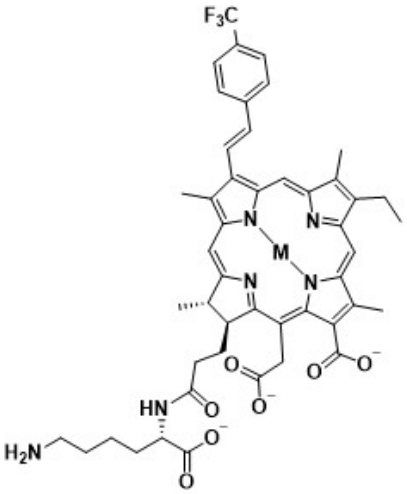
3. The chlorin derivative or the pharmaceutically acceptable salt thereof according to claim 1 or 2, wherein the chlorin derivative or the pharmaceutically acceptable salt thereof is


,

,


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,



or

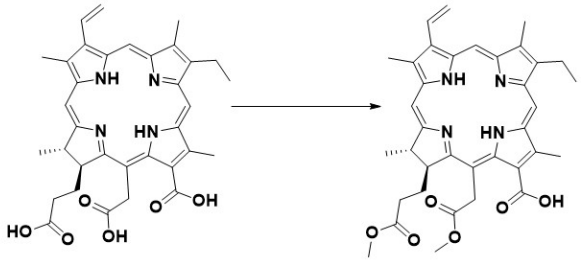


,

wherein M is defined as in claim 1.

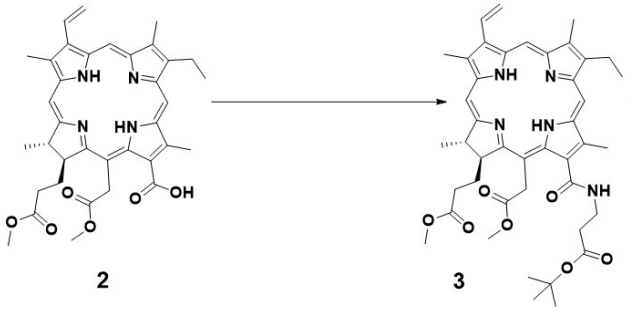
4. A method for preparing the chlorin derivative or the pharmaceutically acceptable salt thereof according to any one of claims 1-3, wherein the method comprises the steps of:

a_1: subjecting compound **1**, namely chlorin e6, to esterification reaction with an alcohol to obtain compound **2**:

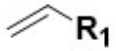


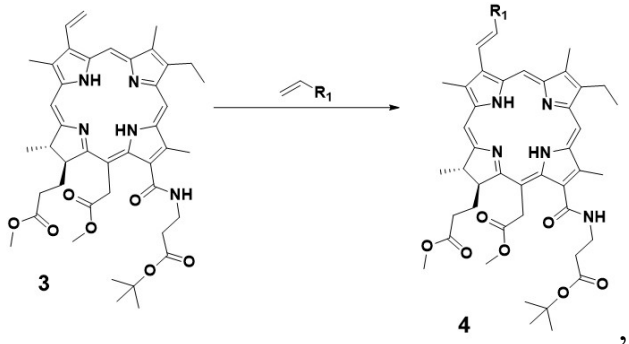
1 **2** ;

b_1: subjecting compound **2** to condensation reaction with β-alanine tert-butyl ester hydrochloride in the presence of a condensation agent to obtain compound **3**:

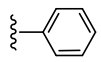
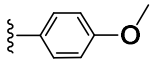
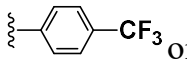
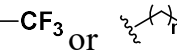


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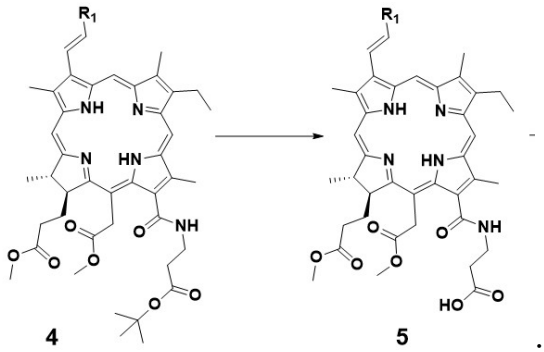
c_1: subjecting compound **3** to olefin metathesis reaction with a substituted α-olefin  in the presence of a catalyst to obtain compound **4**:



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wherein R_1 is , , or , wherein n is any integer from 2 to 7;

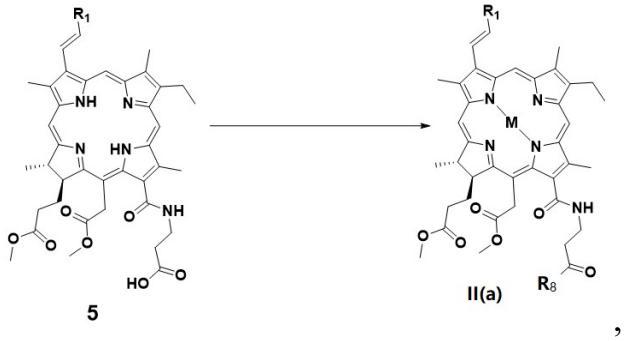
d_1: subjecting compound **4** to hydrolysis reaction to obtain compound **5**:



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e_1: subjecting compound **5** to condensation reaction with an amino acid ester hydrochloride in the presence of a condensation agent to obtain

a compound of formula II(a):



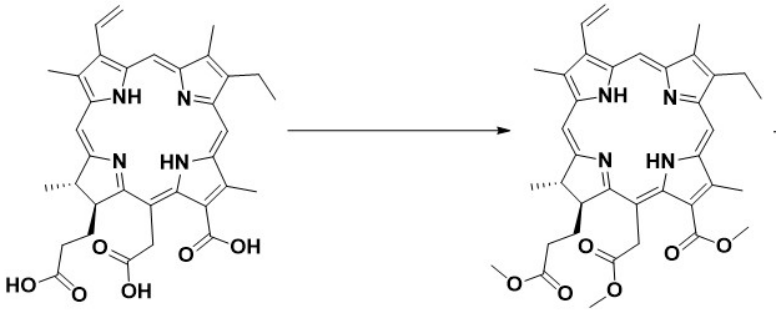
,

wherein M is 2H, or will become a metal ion, for example, a divalent metal ion such as Cu^{2+}, Fe^{2+}, Zn^{2+}, Mg^{2+}, Ni^{2+}, Co^{2+}, Pt^{2+} or Pd^{2+}, or a tetravalent metal ion such as Sn^{4+} or Ti^{4+} upon reaction with a metal chloride or acetate complex, and wherein R_8 is defined as in claim 1; and

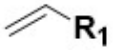
optionally subjecting the compound of formula II(a) to hydrolysis reaction under alkaline conditions to obtain a corresponding salt, that is, a compound of formula II(b);

or alternatively,

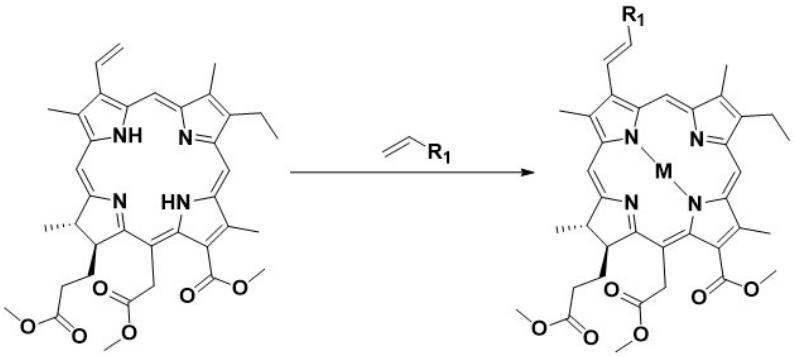
a_2: subjecting compound **1**, namely chlorin e6, to reaction with an alkyl halide under alkaline conditions to obtain compound **10**:



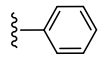
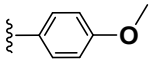
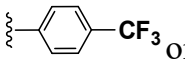
;

b_2: subjecting compound **10** to olefin metathesis reaction with a substituted α-olefin 

in the presence of a catalyst to obtain compound **11**:



10 **11** ,

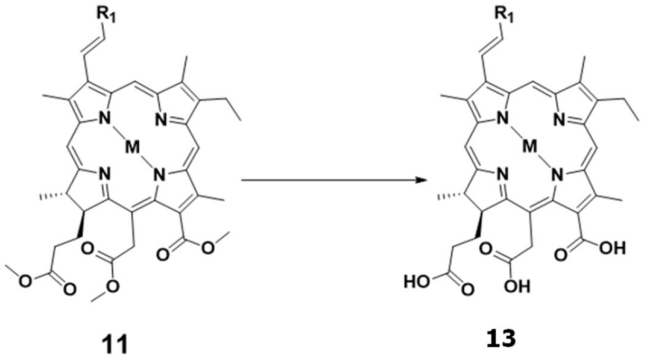
wherein R_1 is , , 

or 

, wherein n is any integer from 2 to 7,

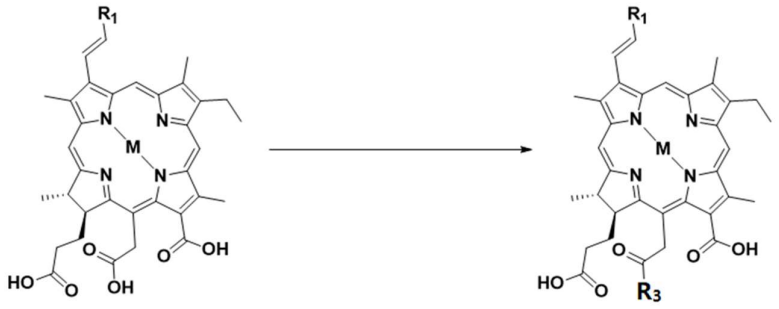
wherein M is 2H, or will become a metal ion, for example, a divalent metal ion such as Cu^{2+}, Fe^{2+}, Zn^{2+}, Mg^{2+}, Ni^{2+}, Co^{2+}, Pt^{2+} or Pd^{2+}, or a tetravalent metal ion such as Sn^{4+} or Ti^{4+} upon reaction with a metal chloride or acetate complex;

c_2: subjecting compound **11** to hydrolysis reaction under alkaline conditions to obtain compound **13**:



11 **13** ;

d_2: subjecting compound **13** to condensation reaction with an amino acid ester hydrochloride to obtain a compound of formula III(a):



13 III(a)

,

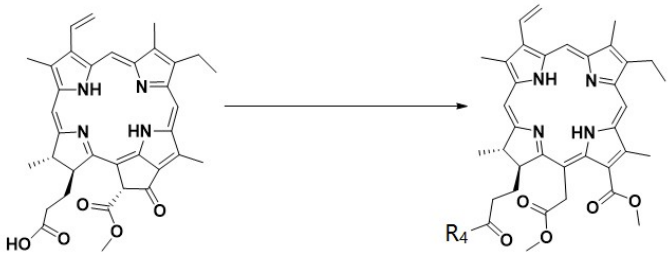
wherein M is 2H, or will become a metal ion, for example, a divalent metal ion such as Cu^{2+}, Fe^{2+}, Zn^{2+}, Mg^{2+}, Ni^{2+}, Co^{2+}, Pt^{2+} or Pd^{2+}, or a tetravalent metal ion such as Sn^{4+} or Ti^{4+} upon reaction with a metal chloride or acetate complex,

wherein R_3 is defined as in claim 1; and

optionally subjecting the compound of formula III(a) to hydrolysis reaction under alkaline conditions to obtain a corresponding salt, namely, a compound of formula III(b);

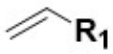
or alternatively,

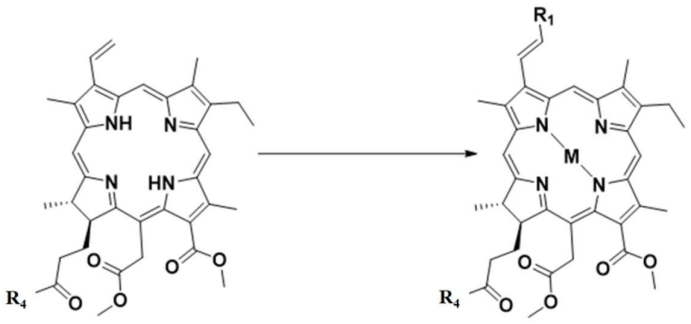
a_3: subjecting compound **19** to condensation reaction with an amino acid ester hydrochloride in the presence of a condensation agent to obtain compound **20**:



19 20

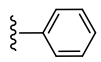
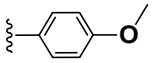
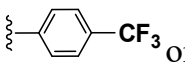
;

b_3: subjecting compound **20** to olefin metathesis reaction with a substituted α-olefin  in the presence of a catalyst to obtain a compound of formula IV(a):



20 IV(a)

,

wherein R_1 is , , or , wherein n is any integer from 2 to 7,

wherein M is 2H, or will become a metal ion, for example, a divalent metal ion such as Cu^{2+}, Fe^{2+}, Zn^{2+}, Mg^{2+}, Ni^{2+}, Co^{2+}, Pt^{2+} or Pd^{2+}, or a tetravalent metal ion such as Sn^{4+} or Ti^{4+} upon reaction with a metal chloride or acetate complex, and wherein R_4 is defined as in claim 1; and

optionally subjecting the compound of formula IV(a) to hydrolysis reaction under alkaline conditions to obtain a corresponding salt, that is, a compound of formula IV(b).

5. An anti-tumor composition, comprising the chlorin derivative or the pharmaceutically acceptable salt thereof according to any one of claims 1-3, and a pharmaceutically acceptable excipient; and preferably, the anti-tumor composition is an injection formulation.

6. The anti-tumor composition according to claim 5, wherein the tumor comprises benign tumor and malignant tumor such as carcinoma *in situ*, e.g., breast cancer, liver cancer, lung cancer, and colorectal cancer; and cancer metastasis, e.g., breast cancer metastasis, liver cancer metastasis, lung cancer metastasis, and colorectal cancer metastasis.

7. Use of the chlorin derivative or the pharmaceutically acceptable salt thereof according to any one of claims 1-3 in the manufacture of an anti-tumor drug; preferably, the anti-tumor drug is an injection formulation.

8. The use according to claim 7, wherein the tumor comprises benign tumor and malignant tumor such as carcinoma *in situ*, e.g., breast cancer, liver cancer, lung cancer, and colorectal cancer; and cancer metastasis, e.g., breast cancer metastasis, liver cancer metastasis, lung cancer metastasis, and colorectal cancer metastasis.

9. The use according to claim 7 or 8, wherein the anti-tumor drug is to be used in photodynamic therapy or sonodynamic therapy.

10. The use according to claim 9, wherein the photodynamic therapy is performed with light waves at a wavelength of 600-800 nm, such as 660 nm, and the sonodynamic therapy is performed with ultrasounds at an intensity of 1.88 W/cm^2.

11. A combination of a chlorin derivative or a pharmaceutically acceptable salt thereof and an ultrasonic medical system, wherein

the chlorin derivative or the pharmaceutically acceptable salt thereof is the chlorin derivative or the pharmaceutically acceptable salt thereof according to any one of claims 1-3; and

the ultrasonic medical system comprises a transducer ultrasonic bed and a contact agent, wherein the transducer ultrasonic bed comprises a bottom and a wall extending upward from the bottom; the bottom is provided, at positions corresponding to head, torso, and limbs of a subject, respectively, with at least one ultrasonic transducer for transmitting ultrasonic waves to the subject thereon; the wall is provided, at positions corresponding to the head and limbs of the subject, respectively, with at least one ultrasonic transducer for transmitting ultrasonic waves to the subject; and the contact agent is used to transmit ultrasonic waves between the subject and the ultrasonic transducers.

12. The combination according to claim 11, wherein the ultrasonic medical system further comprises a transducer module assembly, wherein the transducer module assembly is installed above the transducer ultrasonic bed and comprises at least one ultrasonic transducer for

transmitting ultrasonic waves to the subject therebelow; and the contact agent is also used to transmit ultrasonic waves between the subject and the at least one ultrasonic transducer.

13. The combination according to claim 12, wherein the transducer module assembly further comprises a numerically controlled motion device for controlling the movement of the transducer module assembly in a horizontal and/or vertical direction.

14. The combination according to any one of claims 10-13, wherein the ultrasonic wave is a pulse wave or a continuous wave, and preferably, the ultrasonic wave has a frequency of 0.3 - 3 MHz; and preferably, the ultrasonic wave has a ultrasound intensity of 0.1 - 3 W/cm^2.

15. The combination according to any one of claims 10-14, wherein the contact agent is at least one of water and vacuum degassed cold/hot water.

16. The combination according to any one of claims 10-15, wherein the ultrasonic medical system further comprises an automatic control system with a programmable logic controller, and a contact agent supply system, wherein,

the contact agent supply system is connected to the transducer ultrasonic bed, so as to supply the contact agent to the transducer ultrasonic bed; and

the automatic control system with a programmable logic controller is respectively connected to the transducer ultrasonic bed, the transducer module assembly and the contact agent supply system, so as to control the supply of the contact agent from the contact agent supply system to the transducer ultrasonic bed, and to control the operation of at least some of the ultrasonic transducers in the transducer ultrasonic bed and in the transducer module assembly.

17. The combination according to claim 16, wherein the automatic control system with a programmable logic controller further comprises a

monitoring system for displaying at least one of the following:

a. working parameters of at least some of the ultrasonic transducers in the transducer ultrasonic bed and the transducer module assembly; and

b. lesion information within the subject.

18. The combination according to any one of claims 10-17, wherein the chlorin derivative or the pharmaceutically acceptable salt thereof is prepared according to the method of claim 4.