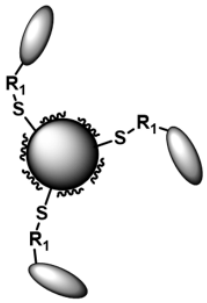
WHAT IS CLAIMED IS:

1. A conductive ink functional material, wherein the conductive ink functional material is a surface-functionalized metal nanoparticle, having a structure as shown in a formula I:



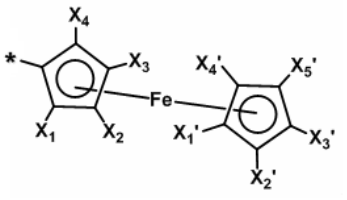
I ;

 is a metal nanoparticle;  is a medium structure;  is a protective agent; and R_1 is an organic structure consisting of C, N, O and H;

wherein the metal is one of Ag, Au, Cu, Zn, Ni, Co, Pd, Pt, Zr, Cr, Ru, Os, Ir, Sn, Pb, Al, Mo, and W.

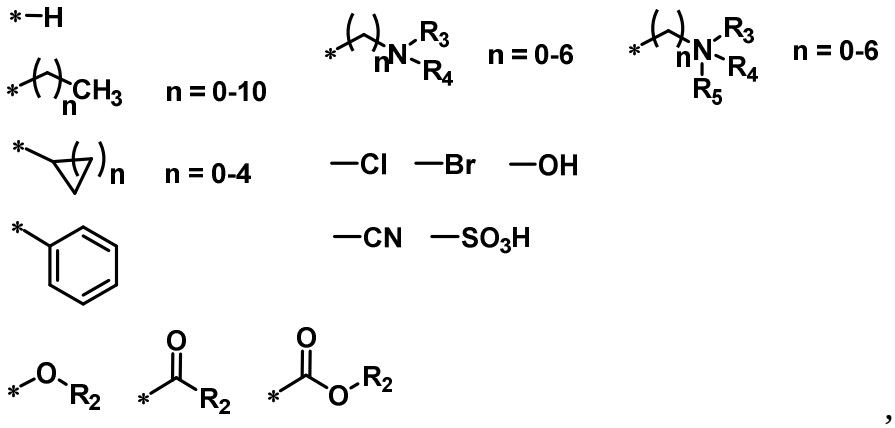
2. The conductive ink functional material according to claim 1, wherein the medium structure is an organic complex of iron; and the R_1 is selected from a linear/branched/cyclic hydrocarbyl, an organic structure containing lipid/ether/amide/quaternary ammonium group/polyethylene glycol, or any combination of the hydrocarbyl and the organic structure.

3. The conductive ink functional material according to claim 2, wherein the medium structure is ferrocene or a derivative thereof having the following structural formula:



,

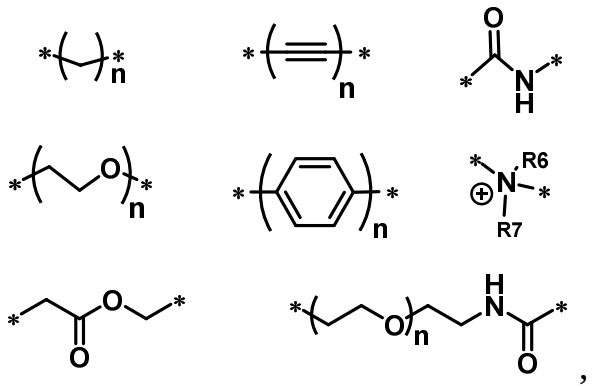
wherein X_1, X_2, X_3, X_4, X_1', X_2', X_3', X_4', and X_5' are independently selected from one of the following groups:



,

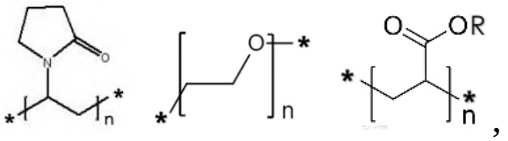
wherein R_2, R_3, R_4, and R_5 are a structure consisting of H, a linear, branched or cyclic hydrocarbyl, and a group containing lipid or ether.

4. The conductive ink functional material according to claim 2, wherein the R_1 is selected from the following structures or any combination thereof:



wherein n is an integer ranging from 1 to 10, and R_6 and R_7 are H or a linear, branched or cyclic hydrocarbyl.

5. The conductive ink functional material according to claim 1, wherein the protective agent is one of polymers with the following structures and has a molecular weight of 500-1,000,000:



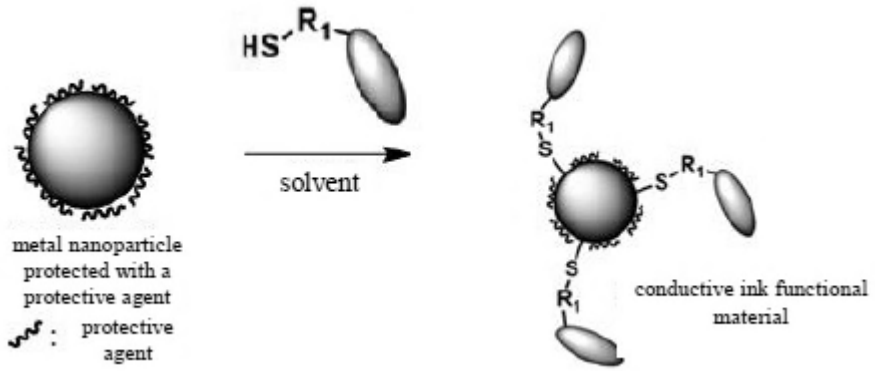
wherein R is a structure consisting of H, a linear, branched or cyclic hydrocarbyl, and a group containing lipid or ether.

6. The conductive ink functional material according to claim 1, wherein the metal is Ag, Au, Pd, or Pt; and the protective agent is one of polyvinylpyrrolidone, polyacrylic acid, polyacrylate, and polyethylene glycol, and has a molecular weight of 1,000-10,000.

7. A functionalized conductive ink, wherein the functionalized conductive

ink is prepared from the conductive ink functional material according to any one of claims 1-6.

8. A preparation method of the conductive ink functional material according to any one of claims 1-6, wherein a reaction route comprises:



dissolving the metal nanoparticle;

adding a surface-functionalized molecule HS-R_1- to an obtained solution;

conducting stirring for a reaction at room temperature;

after the reaction is completed, conducting centrifugation at high speed to separate a solid phase and a liquid phase; and

subjecting the obtained solid phase to washing and vacuum drying to obtain the conductive ink functional material.

9. The preparation method of the conductive ink functional material according to claim 8, wherein

the metal nanoparticle is added to a solvent for full dissolution by

ultrasonic treatment; the surface-functionalized molecule HS-R_1- is added, wherein the mass ratio of the metal nanoparticle to the HS-R_1- is 1,000∶1 to 1∶10;

stirring is conducted for a reaction at room temperature;

after the reaction is completed, centrifugation is conducted at 10,000 rpm to separate a solid phase and a liquid phase; and

the obtained solid phase is washed for 3 times, and then vacuum drying is conducted to obtain the conductive ink functional material.

10. The preparation method of the conductive ink functional material according to claim 9, wherein the mass ratio of the metal nanoparticle to the HS-R_1- is 10∶1 to 1∶10;

the stirring is conducted for a reaction at room temperature for 8 hours; and

after the reaction is completed, the centrifugation is conducted at 10,000 rpm for 1-5 minutes to separate a solid phase and a liquid phase.

11. The preparation method of the conductive ink functional material according to any one of claims 9-10, wherein a preparation method of the metal nanoparticle comprises:

dissolving a metal salt and a protective agent at a mass ratio of 10∶1 to 1∶1,000 in a solvent separately;

heating a protective agent solution to 120 ℃, and

adding a metal salt solution dropwise under stirring;

after the dropping is completed, conducting stirring continuously for a reaction at 120 ℃ for 6 hours, and

conducting cooling to room temperature;

after the reaction is completed, conducting washing on an obtained solution for 3 times; and drying a precipitate at 40 ℃ for 12 hours to obtain the metal nanoparticle.

12. A preparation method of the functionalized conductive ink according to claim 7, wherein

a conductive ink functional material and water are mixed and subjected to ultrasonic treatment; diethylene glycol and glycerol are added for adjusting the viscosity to 5-200 CPS, so as to obtain a functionalized conductive ink containing the conductive ink functional material with a mass concentration of 5%-40%; and then the functionalized conductive ink is filtered and stored.

13. Application of the functionalized conductive ink according to claim 7 to a biosensor.

14. The application of the functionalized conductive ink according to claim 13, wherein electrodes of the biosensor are prepared by printing with a general conductive ink first; next, one electrode is completely covered with the

functionalized conductive ink by an inkjet printing or micro-dropping method, and subjected to drying, followed by heat curing or NIR photocuring; and then, a glucose oxidase-containing solution is dropped on the surface of the electrode, and subjected to drying, so as to form a working electrode.

15. The application of the functionalized conductive ink according to claim 14, wherein the heat curing is conducted at a temperature of 70-100 ℃; and the NIR photocuring is conducted at 800-1,200 nm and 0.1- 2 mW/m^2.