CLAIMS:

1. A method for preparing an immunoelectrode system adopted by a microfluidic detection chip, comprising the following specific steps:

(1) preparation of a conductive polymer layer: a conductive polymer layer is prepared on a gold-plated base layer to obtain conductive polymer/gold-plated base layer;

(2) preparation of the immunoelectrode: an antibody layer is prepared on the conductive polymer layer to obtain antibody/conductive polymer/gold-plated base layer, wherein the antibody is D-Dimer antibody;

(3) porous modification on a surface: a surface of the antibody layer of the antibody/conductive polymer/gold-plated base layer is subjected to porous modification; and

(4) formation of the immunoelectrode system: a bare gold-plated base layer is fixed to an outer side of the porous protective layer/antibody/conductive polymer/gold-plated base layer to obtain the immunoelectrode system, wherein the porous protective layer/antibody, the conductive polymer layer, and the gold-plated base layer are sequentially attaching from bottom to top;

wherein the bare gold-plated base layer fixed to the outer side of the porous protective layer/antibody/conductive polymer/gold-plated base layer is an standard electrode and porous protective layer/antibody/conductive polymer/gold-plated base layer is a working electrode.

2. The method for preparing an immunoelectrode system according to claim 1, wherein, in the step (3), a method for the porous modification on a surface of the antibody layer adopts polystyrene or polyaniline or tert-butyl polyacrylate or polycarbonate or polyvinyl alcohol as a film forming reagent material and chloroform or tetrahydrofuran or benzene or CS_2 as a solvent, and the film forming reagent material and the solvent are uniformly mixed and then dropwise added to a surface of the antibody/conductive polymer/gold-plated base layer so that a porous protective layer is obtained on the surface of the antibody layer of the antibody/conductive polymer/gold-plated base layer.

3. The method for preparing an immunoelectrode system according to claim 2, wherein the step (1) includes the following specific steps:

S11. a gold-plated base layer after gold plating is cleaned with ethanol and water, and dried in air for later use; and

S12. the gold-plated base layer is put in a reaction and subjected to an overnight no-light reaction in a nitrogen atmosphere and under an ice-bath condition, the time of the overnight reaction being 10-16 h, and then rinsed with pure water and blown dry with nitrogen, so as to modify a surface of the gold-plated base layer with a conductive polymer, to obtain conductive polymer/gold-plated base layer.

4. The method for preparing an immunoelectrode system according to claim 3, wherein the step (2) includes the following specific steps:

S21. an antibody solution is dropwise added to a surface of the conductive polymer/gold-plated base layer obtained in the step (1), and it is allowed to stand at 37°C and incubated for 1-2 h, and rinsed with a 0.1% Tween-20 solution to obtain antibody/conductive polymer/gold-plated base layer; and

S22. a blocking buffer is dropwise added to a surface of the antibody/conductive polymer/gold-plated base layer immunoelectrode, and it is allowed to stand at 37°C for 0.5-1.5 h to block inactive sites for later use.

5. The method for preparing an immunoelectrode system according to claim 4, wherein, in the step (3), a mass fraction of the film forming reagent material in the solvent is 1-20%, the film forming reagent material and the solvent are uniformly mixed and then dropwise added to a surface of the antibody/conductive polymer/gold-plated base layer under the conditions of 25°C and a relative humidity of 50-90%, and after the solvent is completely volatilized, a porous protective layer is formed on the surface of the antibody layer of the antibody/conductive polymer/gold-plated base layer.

6. The method for preparing an immunoelectrode system according to claim 4, wherein the base layer is a PET or PP or PE or ABS flexible base layer; in the step S12, the composition of the reaction includes ferric chloride, a conductive polymer and hydrochloric acid, wherein the concentration of the ferric chloride is 0.01-0.5 mol/L, the concentration of the conductive polymer is 0.01-0.5 mol/L, and the concentration of the hydrochloric acid is 0.01-0.5 mol/L; in the step S21, 15 μL of a 0.024 mg/mL antibody is dropwise added to a surface of the conductive polymer/gold-plated base layer obtained in the step (1); in the step S22, a 2% BSA blocking buffer is dropwise added to a surface of the porous protective layer/antibody/conductive polymer/gold-plated base layer; and in the step (3), a gold-plated base layer is fixed to an outer side of the antibody/conductive polymer/gold-plated base layer by using a double-sided adhesive, a reactive tank having a length of 0.1-0.8 cm and a width of 0.1-0.6 cm.

7. The method for preparing an immunoelectrode system according to claim 6, wherein, in the step S12, the composition of the reaction includes ferric chloride, a conductive polymer, hydrochloric acid and sodium dodecyl sulfonate.

8. A microfluidic detection chip using the immunoelectrode system, the chip including a lower-layer chip, a middle-layer chip and an upper-layer chip sequentially from bottom to top; the lower-layer chip, the middle-layer chip and the upper-layer chip cooperate with each other to define a closed micro-flow channel and a plurality of mutually independent chambers; the micro-flow channel and the chambers all penetrate through the middle-layer chip; a sample inlet is formed in the upper-layer chip and communicated with the chambers through the micro-flow channel; and the microfluidic detection chip further includes the immunoelectrode system having a standard electrode and a working electrode, the standard electrode includes a gold-plated base layer, the working electrode includes a gold-plated base layer, a conductive polymer layer and an antibody layer, and the gold-plated base layer, the conductive polymer layer and the antibody layer are sequentially attached from bottom to top.

9. The microfluidic detection chip according to claim 8, wherein each of the chambers includes a reaction cavity and a waste liquid cavity, the reaction cavity and the waste liquid cavity are both disposed on the middle-layer chip, the micro-flow channel includes a flow channel I, a stop valve site II is disposed on the flow channel I between the reaction cavity and the waste liquid cavity, and the immunoelectrode is divided into an upper-layer immunoelectrode disposed on the back of the upper-layer chip and a lower-layer immunoelectrode disposed on the front of the lower-layer electrode; a gap exists between the upper-layer immunoelectrode and the lower-layer immunoelectrode; and the upper-layer immunoelectrode on the back of the upper-layer chip and the lower-layer immunoelectrode on the front of the lower-layer chip are both disposed corresponding to the position of the reaction cavity of the middle-layer chip, the upper-layer immunoelectrode and the lower-layer immunoelectrode are communicated with each other through the reaction cavity, the upper-layer immunoelectrode is a standard electrode, and the lower-layer immunoelectrode is a working electrode.

10. The microfluidic detection chip according to claim 9, wherein the reaction cavity includes a reaction cavity I and a reaction cavity II, the micro-flow channel further includes a flow channel II, a stop valve site I is disposed on the flow channel II between the reaction cavity I and the reaction cavity II, the upper-layer immunoelectrode on the back of the upper-layer chip and the lower-layer immunoelectrode on the front of the lower-layer chip are both disposed corresponding to the position of the reaction cavity II of the middle-layer chip, and the upper-layer immunoelectrode and the lower-layer immunoelectrode are communicated with each other through the reaction cavity II.

11. The microfluidic detection chip according to claim 10, wherein each of the chambers further includes a cleaning solution cavity, the micro-flow channel further includes a sub-flow channel, the flow channel II extends outward from an outer side of the flow channel II between the reaction cavity II and the stop valve site I and is provided with the sub-flow channel, and the sub-flow channel is connected to the cleaning solution cavity.

12. The microfluidic detection chip according to claim 10, wherein an upper-layer communication hole is formed in the upper-layer chip, a lower-layer communication hole is formed in the lower-layer chip, the upper-layer immunoelectrode is in contact connection to a matching detection instrument through the lower-layer communication hole, and the lower-layer immunoelectrode is in contact connection to the matching detection instrument through the upper-layer communication hole.

13. The microfluidic detection chip according to claim 11, wherein each of the chambers further includes a buffer solution cavity, the sub-flow channel extends outward from an outer side of the sub-flow channel and is provided with a sub-flow channel I, and the sub-flow channel I is connected to the buffer solution cavity.