Claims

1. An electro-fluid jetting device for printing a three-dimensional biological scaffold comprising:

a solution supply system including a spray needle;

a motion platform driven by a driving mechanism to move along the X, Y, Z axes;

a motion control system which is connected to the driving mechanism and controls the movement of the driving mechanism;

a carrier facing a nozzle of the spray needle and connected to the motion platform so as to move with the motion platform along the X and Y axes;

a power source which is connected to and powers the driving mechanism and the solution supply system respectively.

2. The electro-fluid jetting device according to claim 1, wherein the spray needle is arranged along the Z-axis of the motion platform and controls the driving mechanism to move along the Z-axis of the motion platform by means of the motion control system so as to adjust the distance from the spray needle to the carrier.

3. The electro-fluid jetting device according to claim 1 or 2, wherein the solution supply system further includes an injector, a plastic hose and an injection pump, the injection pump, the injector, the plastic hose and the spray needle being sequentially connected with one another; a grounding electrode of the power source is connected to the spray needle and a positive pole of the power source is connected to the carrier.

4. The electro-fluid jetting device according to any one of claims 1 to 3, wherein the electro-fluid jetting device further includes a temperature control device for regulating a temperature of an area where the motion platform is located, the temperature control device including a heating pipe and a temperature control switch electrically connected to the heating pipe.

5. A method for printing a three-dimensional biological scaffold using the electro-fluid jetting device according to any one of claims 1 to 4, wherein the carrier of the electro-fluid jetting device is provided with a polished silicon crystal substrate, the method comprising:

i) adding a biological scaffold polymer solution into the solution supply system;

ii) setting up a moving speed and a moving path of the motion platform during printing by the motion control system, adjusting a distance from the spray needle to the polished silicon crystal substrate, and setting up an injection rate of the solution;

iii) turning on the power source and applying a voltage between the spray needle and the carrier.

6. The method for printing a three-dimensional biological scaffold according to claim 5, wherein the biological scaffold polymer is polycaprolactone (PCL).

7. The method for printing a three-dimensional biological scaffold according to claim 6, wherein the biological scaffold polymer is mixed in glacial acetic acid.

8. The method for printing a three-dimensional biological scaffold according to claim 5, 6 or 7, wherein the biological scaffold polymer solution has a concentration of 60-80% by weight/volume of biological scaffold polymer.

9. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 8, wherein the method for printing the three-dimensional biological scaffold further comprises setting up a temperature from 26 ºC to 30 ºC at the area where the motion platform is located.

10. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 9, wherein a whipping jet is obtained between the spray needle and the carrier after the step of turning on the power

source and applying a voltage between the spray needle and the carrier.

11. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 10, wherein the moving speed of the motion platform along X and Y axes is set as from 10 mm/s to 300 mm/s to control the cycle and amplitude of a spiral structure.

12. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 11, wherein the voltage between the spray needle and the carrier is set as from 2 kV to 4 kV to control the cycle and amplitude of a spiral structure.

13. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 12, wherein the distance between the spray needle and the polished crystal substrate is set as from 2.5 mm to 5 mm to control the cycle and amplitude of a spiral structure.

14. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 13, wherein the voltage between the spray needle and the carrier is set as from 2 kV to 4 kV, the moving speed of the motion platform along the X and Y axes is set from 10 mm/s to 300 mm/s, respectively, the distance from the spray needle to the polished silicon crystal substrate is set as from 2.5 mm to 5 mm, and the injection rate of the solution is set as from 0.1 μl/min to 10 μl/min.

15. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 13, wherein the voltage between the spray needle and the carrier is set as 2.55 kV, the moving speed of the motion platform along the X and Y axes is set as 60 mm/s, the distance from the spray needle to the polished silicon crystal substrate is set as 3.5 mm, and the injection rate of the solution is set as 1 μl/min.

16. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 13, wherein the voltage between the spray

needle and the carrier is set as 2.55 kV, the moving speed of the motion platform along the X and Y axes is set as 100 mm/s, the distance from the spray needle to the polished silicon crystal substrate is set as 3.5 mm, and the injection rate of the solution is set as 1 μl/min.

17. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 13, wherein the voltage between the spray needle and the carrier is set as 2.55 kV, the moving speed of the motion platform along the X and Y axes is set as 80 mm/s, the distance from the spray needle to the polished silicon crystal substrate is set as 3.5 mm, and the injection rate of the solution is set as 1 μl/min.

18. The method for printing a three-dimensional biological scaffold according to any one of claims 5 to 13, wherein the voltage between the spray needle and the carrier is set as 3.5 kV, the moving speed of the motion platform along the X and Y axes is set as 60 mm/s, the distance from the spray needle to the polished silicon crystal substrate is set as 3.5 mm, and the injection rate of the solution is set as 6 μl/min.