CLAIMS

What is claimed is:

1. A method for preparing a patterned substrate, the method comprising:
    a) melt-spinning at least one biocompatible polymer to form fibers;
    b) collecting the fibers on a substrate such that the fibers are aligned on the substrate; and
    c) applying a binding agent to the aligned fibers to bond the fibers into the aligned arrangement to obtain the patterned substrate in form of an aligned fiber mat.

2. The method according to claim 1, wherein collecting the fibers on a substrate comprises rotating the substrate such that the fibers are collected circumferentially around the substrate.

3. The method according to claim 1 or 2, wherein the substrate is a hollow tube comprising a biocompatible polymer.

4. The method according to claim 3, wherein the hollow tube is prepared by
    a) providing a cylindrical element having a first layer comprising a water-soluble polymer coated on a lateral surface of the cylindrical element;
    b) coating a second layer comprising a biocompatible polymer on the first layer;
    c) immersing the cylindrical element having the first and the second layer coated thereon in an aqueous solution to remove the first layer, and
    d) separating the second layer from the cylindrical element to obtain the hollow tube.

5. The method according to claim 4, wherein providing a cylindrical element having a first layer comprising a water-soluble polymer coated on a lateral surface of the cylindrical element comprises dip-coating the cylindrical element in a liquid reagent comprising the water-soluble polymer.

6. The method according to claim 4 or 5, wherein the water-soluble polymer comprises polyvinyl alcohol.

7. The method according to any one of claims 4 to 6, wherein coating a second layer comprising a biocompatible polymer on the first layer comprises dip-coating the cylindrical element having the first layer coated thereon in a liquid reagent comprising the biocompatible polymer dissolved in an organic solvent.

8. The method according to any one of claims 3 to 7, wherein an inner surface of the hollow tube is treated with an alkaline solution.

9. The method according to claim 8, wherein the inner surface of the hollow tube is further treated with at least one of gelatin and collagen.

10. The method according to claim 9, wherein the at least one of gelatin and collagen is immobilized on the inner surface of the hollow tube by carbodiimide crosslinking.

11. The method according to any one of claims 3 to 10, wherein the hollow tube has a diameter in the range of about 2 mm to about 5 mm.

12. The method according to any one of claims 1 to 11, wherein the biocompatible polymer is a biostable polymer or a biodegradable polymer.

13. The method according to any one of claims 1 to 12, wherein the biocompatible polymer is selected from the group consisting of elastin, collagen, polyurethane, polycaprolactone, polylactide, polyglycolic acid, mixtures thereof, and copolymers thereof.

14. The method according to any one of claims 1 to 13, wherein the binding agent is selected from the group consisting of gel-forming polysaccharides or proteins,

polypeptides, alginate, glycosaminoglycans, hyaluronate, collagen, chitosan, gelatin, dopamine and mixtures thereof.

15. The method according to any one of claims 1 to 14, wherein the biocompatible polymer of the fibers comprises a copolymer of polycaprolactone and polylactide, with the polylactide present in the range of about 50 wt% to about 80 wt% of the copolymer.

16. The method according to claim 1, wherein the binding agent is gelatin.

17. The method according to any one of claims 1 to 16, wherein diameter of each fiber is about 10 μm.

18. A method for forming an implant for tissue engineering, the method comprising

a) providing a patterned substrate prepared by a method according to any one of claims 1 to 17;

b) applying one or more species of living cells to the patterned substrate;

c) incubating the patterned substrate comprising the one or more species of living cells under conditions which allow proliferation of the one or more species of living cells; and

d) degrading the patterned substrate to obtain the implant.

19. The method according to claim 18, wherein the one or more species of living cells is selected from the group consisting of cardiomyocytes, induced progenitor cells, smooth muscle cells, fibroblasts, and mesenchymal stem cells.

20. The method according to claim 18 or 19, wherein the implant for tissue engineering forms at least part of a vascular prosthesis or a heart patch.