CLAIMS

What is claimed is:

1. A method of making a spheroid including one or more biologically-relevant materials, comprising:

providing a suspension including one or more biologically-relevant materials dispersed within a biocompatible medium;

depositing an amount of a hydrophilic material on a defined area of a superhydrophobic surface, said hydrophilic material comprises a polyoxyethylene-polyoxypropylene block copolymer; and

bioprinting a droplet of the suspension onto the hydrophilic material

wherein the biocompatible medium is a gel, a semi-solid, or a liquid and the biocompatible medium is suitable for use as a three-dimensional substrate.

2. The method of claim 1, wherein the one or more biologically-relevant materials comprises magnetic beads, stromal vascular fraction cells, stem cells, one or more relevant cells, or combinations thereof.

3. The method of claim 1, wherein the biocompatible medium comprises a hydrogel.

4. The method of claim 3, wherein the hydrogel is comprised of a material selected from the group consisting of agarose, alginate, collagen, fibrinogen, fibrin, laminin, a polyoxyethylene-polyoxypropylene block copolymer, silicone, polysaccharide, polyethylene glycol, and polyurethane.

5. The method of claim 4, wherein the hydrogel is comprised of collagen type I.

6. The method of claim 1, wherein the one or more biologically-relevant materials comprises stromal vascular fraction cells.

7. The method of claim 1, wherein the one or more biologically-relevant materials comprises

tissue derived microvascular fragments.

8. The method of claim 1, wherein the one or more biologically-relevant materials comprises one or more islet cells.

9. The method of claim 1, wherein the step of bioprinting the droplet of the suspension comprises direct-write printing the suspension.

10. The method of claim 1, wherein the super-hydrophobic surface has a water contact angle of greater than about 150º.

11. The method of claim 10, wherein the water contact angle is about 150º to about 170º.

12. The method of claim 1, wherein the step of bioprinting the droplet comprises bioprinting a droplet having a diameter of about 0.2 mm to about 5 mm.

13. The method of claim 1, further comprising the step of incubating the spheroids at physiological temperatures for a period of time subsequent to bioprinting the droplet.

14. The method of claim 1, further comprising the step of culturing the spheroids in a cell culture medium subsequent to bioprinting the droplet.

15. The method of claim 1, wherein the biocompatible medium comprises a polymer or a hydrogel.

16. A method of making a spheroid including one or more biologically-relevant materials, comprising:

providing a suspension including one or more biologically-relevant materials dispersed within a biocompatible medium;

depositing an amount of a hydrophilic material on a defined area of a superhydrophobic surface, said hydrophilic material comprises a polyoxyethylene-polyoxypropylene block copolymer; and

bioprinting a droplet of the suspension onto the hydrophilic material

wherein the biocompatible medium is a hydrogel.

17. The method of claim 16, wherein the one or more biologically-relevant materials comprises magnetic beads, stromal vascular fraction cells, stem cells, one or more relevant cells, or combinations thereof.

18. The method of claim 16, wherein the hydrogel is comprised of a material selected from the group consisting of agarose, alginate, collagen, fibrinogen, fibrin, laminin, a polyoxyethylene-polyoxypropylene block copolymer, silicone, polysaccharide, polyethylene glycol, and polyurethane.

19. The method of claim 16, wherein the hydrogel is comprised of collagen type I.

20. The method of claim 16, wherein the one or more biologically-relevant materials comprises stromal vascular fraction cells.

21. The method of claim 16, wherein the one or more biologically-relevant materials comprises tissue derived microvascular fragments.

22. The method of claim 16, wherein the one or more biologically-relevant materials comprises one or more islet cells.

23. The method of claim 16, wherein the step of bioprinting the droplet of the suspension comprises direct-write printing the suspension.

24. The method of claim 16, wherein the super-hydrophobic surface has a water contact angle of greater than about 150º.

25. The method of claim 24, wherein the water contact angle is about 150º to about 170º.

26. The method of claim 16, wherein the step of bioprinting the droplet comprises bioprinting a

droplet having a diameter of about 0.2 mm to about 5 mm.

27. The method of claim 16, further comprising the step of incubating the spheroids at physiological temperatures for a period of time subsequent to bioprinting the droplet.

28. The method of claim 16, further comprising the step of culturing the spheroids in a cell culture medium subsequent to bioprinting the droplet.