CLAIMS

1. A method of forming a porous three-dimensional hydrogel structure, the method comprising:

dispensing into a volume space, a bioink comprising an aqueous medium and granular crosslinkable hydrogel precursor particles suspended in the aqueous medium, wherein the granular crosslinkable hydrogel precursor particles have an average size of from 100 microns to 500 microns; and

crosslinking and allowing the granular crosslinkable hydrogel precursor particles to adhere to one another, thereby forming a porous three-dimensional hydrogel structure having pore diameters in the range of from 20 microns to 200 microns;

wherein prior to the step of crosslinking the granular crosslinkable hydrogel precursor particles, the method further comprises extruding a sacrificial material into the bioink to form hydrogel fibers within the bioink.

2. The method of claim 1, wherein after the step of crosslinking the granular crosslinkable hydrogel precursor particles, the method further comprises removing the hydrogel fibers to create channels in the hydrogel structure.

3. The method of claim 1, wherein the step of crosslinking the granular crosslinkable hydrogel precursor particles comprises applying ultraviolet light, and optionally heat at a temperature of no more than 32°C.

4. The method of claim 2, wherein removing the hydrogel fibers comprises removing cations from the bioink.

5. The method of claim 4, wherein removing cations from the bioink comprises adding a cation chelator to the bioink.

6. The method of claim 1, wherein the granular crosslinkable hydrogel precursor particles comprise one or more of gelatin, alginate, or derivatives thereof.

7. The method of claim 6, wherein the granular crosslinkable hydrogel precursor particles comprise gelatin methacrylate.

8. The method of claim 1, wherein the bioink further comprises an initiator to facilitate crosslinking of the granular crosslinkable hydrogel precursor particles.

9. The method of claim 8, wherein the initiator comprises a photoinitiator, optionally wherein the photoinitiator is lithium phenyl-2,4,6-trimethylbenzoylphosphinate.

10. The method of claim 4, wherein the cations comprise Ca^{2+}.

11. A porous three-dimensional hydrogel structure, the hydrogel structure comprising,

granular hydrogel precursor particles having an average size of from 100 microns to 500 microns that are crosslinked and adhered to one another,

wherein spaces between the crosslinked granular hydrogel precursor particles result in pores in the hydrogel structure with pore diameters in the range of from 20 microns to 200 microns, and

wherein the hydrogel structure further comprises one or more channels with a length of from 300 microns to 800 microns and

wherein the channels assume the shape of hydrogel fibers that have been removed from the hydrogel structure.