3D printing of cellulose nanofiber/gelatin methacrylamide composite hydrogels

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The three-dimensional (3D) bioprinting of tissue constructs with extracellular matrix (ECM) like materials have regarded essential in the field of tissue engineering and regenerative medicine. However, a common challenge when 3D print hydrogels has been noted in the usage of low concentration of precursor solutions because these inks of low viscosity tend to collapse during the printing process. In this study, insufficient rheological properties of gelatin mathacrylamide (GelMA) could be successfully reinforced by incorporating cellulose nanofiber (CNF) so that the printed scaffolds could maintain their structural fidelity before the crosslinking process. Due to the high viscosity and outstanding shear thinning properties of CNF itself, GelMA and a low ratio of CNF composite inks also showed high zero shear viscosity and structural fidelity with less dispensing pressure. Additionally, the biocompatibility of scaffold-reinforced hydrogels was evaluated by conducting viability and proliferation test of fibroblast cell line.