Extrudable Biopolymer for Extrusion Type 3D Printing/In-situ Photocuring for Tissue Engineering

Briana Canet

3D printing technologies discern themselves from standard manufacturing techniques by building required parts layer-by-layer to produce highly configured engineering components without additional tooling. A plethora of 3D technologies exists, including stereolithography (SLA) and fused deposition modeling (FDM). Although both printing techniques work on the similar principle, in SLA printing, photopolymeric components are built employing UV radiation to build each layer. In contrast, FDM printing is used to build thermoplastic materials, utilizing temperature gradient to cure the built components. Here in, an FDM technique is modified to incorporate SLA type 3D printing, so as to extrude highly viscous biopolymer which is photocured by in-situ UV radiation. The technique developed will aid in the new material development mainly for bio-scaffold design in tissue engineering at a lower processing cost and accelerated rate. The presentation highlights the development of novel polyethylene glycol diacrylate/polyethylene oxide and pentaerythritol triacrylate/polyethylene oxide composites formulated to suite the 3D printing technique adopted in this study. Highly viscous polymeric composites were composed to achieve extrudability. The work also highlights the advantages and some limitations of the technique and materials developed.