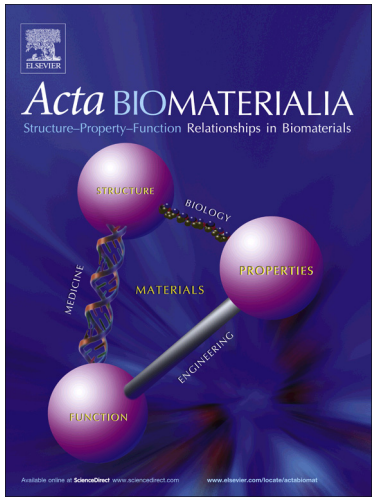
Accepted Manuscript



Short communication

3D freeform printing of silk fibroin

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PII: S1742-7061(18)30118-1
DOI: https://doi.org/10.1016/j.actbio.2018.02.035
Reference: ACTBIO 5340

To appear in: *Acta Biomaterialia*

Received Date: 23 November 2017
Revised Date: 13 February 2018
Accepted Date: 28 February 2018

Please cite this article as: Rodriguez, M.J., Dixon, T.A., Cohen, E., Huang, W., Omenetto, F.G., Kaplan, D.L., 3D freeform printing of silk fibroin, *Acta Biomaterialia* (2018), doi: https://doi.org/10.1016/j.actbio.2018.02.035

Article type: Brief Communication

3D Freeform Printing of Silk Fibroin

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Keywords: silk, printing, freeform, biomaterials, laponite

Abstract

Freeform fabrication has emerged as a key direction in printing biologically-relevant materials and structures. With this emerging technology, complex structures with microscale resolution can be created in arbitrary geometries and without the limitations found in traditional bottom-up or top-down additive manufacturing methods. Recent advances in freeform printing have used the physical properties of microparticle-based granular gels as a medium for the submerged extrusion of bioinks. However, most of these techniques require post-processing or crosslinking for the removal of the printed structures. [1,2] In this communication, we introduce a novel method for the one-step gelation of silk fibroin within a suspension of synthetic nanoclay (Laponite) and polyethylene glycol (PEG). Silk fibroin has been used as a biopolymer for bioprinting in several contexts, but chemical or enzymatic additives or bulking agents are needed to stabilize 3D structures. Our method requires no post-processing of printed structures and allows for *in situ* physical crosslinking of pure aqueous silk fibroin into arbitrary geometries produced through freeform 3D printing.

1. Introduction

Silk fibroin is an attractive biopolymer for diverse applications due to its all-aqueous and