

Abstract Submitted
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Rapid 3D Printing of Multifunctional Calcium Alginate Gel Pipes using Coaxial Jet Extruder¹ KONRAD RYKACZEWSKI, VIRAJ DAMLE, Arizona State University — Calcium alginate (CA) forms when solution containing sodium alginate (SA) comes in contact with a CaCl₂ solution. The resulting gel is biocompatible as well as edible and is used in production of bio-scaffolds, artificial plant seeds, and edible substances. In the latter application, referred to in the culinary world as “spherification,” flavored liquids are mixed with the SA and dripped into CaCl₂ solution to form gel encapsulated flavored “marbles.” Previously, crude 3D printing of CA structures has been achieved by stacking of such flavored liquid filled marbles [1]. In turn, solid CA rods have been fabricated by properly mixing flow of the two solutions using a microfluidic device [2]. Here we show that by using two circular cross-section coaxial nozzles to produce coaxial jets of the SA and CaCl₂ solutions, liquid filled CA micro-to-mili scale gel pipes can be produced at speeds around ~ 150 mm/s. Such extrusion rate is compatible with most commercially available 3D printers, facilitating adoption of the CA pipe coaxial jet extruder. Here, the impact of inner and outer liquid properties and flow speeds on the gel pipe extrusion process is discussed.

[1] www.dovetailed.co

[2] Beyer et al. *Solid-State Sens., Act.nMicrosys.* 2013, 1206-1209.

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