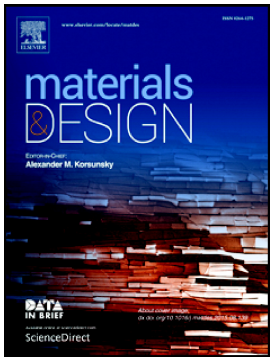

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3D printing for functional electronics by injection and package of liquid metals into channels of mechanical structures

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Abstract

With the fabrication freedom and high efficiency introduced by 3D printing, such technology has been explored in the electronic manufacturing processes. In the present work, we reported a developed method for the fabrication of functional electronics with liquid phase electronic circuits. The technique involves printing hollow channels within elastomer structures via fused deposition modeling (FDM), then injecting and encapsulating liquid metal to form electrical traces. The process parameters in printing elastomer objects and the design of hollow channels were investigated via the extrusion experiments. The influence of flow rates on liquid metal injection was also studied under pressure injection. Based on these discussions and validations, the relationships between process parameters and the printing structures were demonstrated, and the flexible substrate with hollow channels was successfully printed by optimization of the process parameters. Moreover, a probe signal circuit has been fabricated to demonstrate the ability of injecting and packaging liquid metal into 3D printed structures for functional electronics.

Keywords: 3D printing, Functional electronics, Additive manufacturing, Hollow channel, Liquid metal injection

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