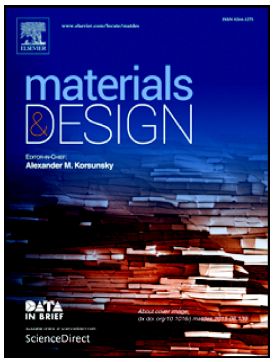

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Inkjet Printed Polyethylene Glycol as a Fugitive Ink for the Fabrication of Flexible Microfluidic Systems

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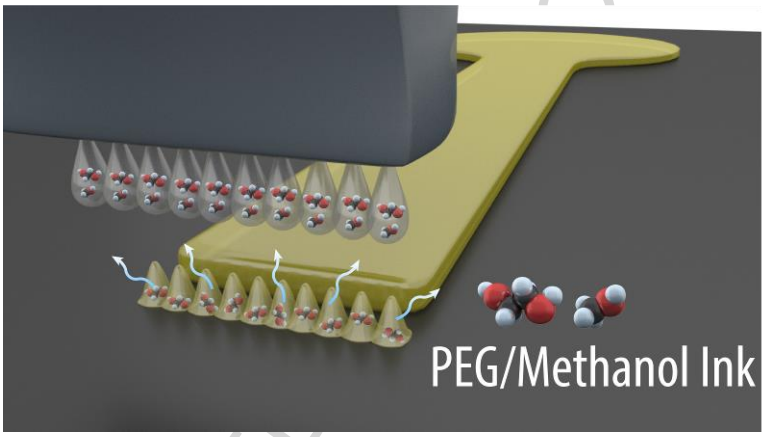
Keywords: inkjet printing, polyethylene glycol, microfluidic, microsystems, flexible electronics

Graphical Abstract



Highlights

- A unique method for fabricating microfluidic systems based on inkjet printing of Polyethylene glycol as a fugitive ink is introduced.
- The developed approach allows realizing microfluidic structures with controlled dimensions and high vertical resolution.
- The processing technique allows the realization of scalable and flexible microfluidic systems and microfluidic electronics.
- The developed technology allows fabricating microsystems with a range of structural and substrate material options.

Abstract

This paper demonstrates a novel and simple processing technique for the realization of scalable and flexible microfluidic microsystems by inkjet-printing polyethylene-glycol (PEG) as a sacrificial template, followed by embedding in a structural layer (e.g. soft elastomers). The printing technology allows production of an array of PEG droplets simultaneously, reducing cost and manufacturing time. The PEG can be removed through heating above its phase-change temperature after the formation of the structural layer, with hydraulic flow removing the material. The developed technique allows easy modulation of the shape and dimensions of the pattern with the ability to generate complex architectures without using lithography. The method produces robust planar and multilayer microfluidic structures that can be realized on wide range of substrates. Moreover, microfluidics can be realized on other systems (e.g. electrodes and transducers) directly without requiring any bonding or assembling steps, which often limit the materials selection in conventional