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# Fabricating Method for Complex 3D Microfluidic Channel Using Soluble Wax Mold

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**Abstract :** PDMS (Polydimethylsiloxane)-based microfluidic device has been recently applied to area of biomedical research, tissue engineering, and diagnostics because PDMS is low cost, nontoxic, optically transparent, gas-permeable, and especially biocompatible. Generally, PDMS microfluidic devices are fabricated by conventional soft lithography. Microfabrication requires expensive cleanroom facilities and a lot of time; however, only two-dimensional or simple three-dimensional structures can be fabricated. In this study, we introduce fabricating method for complex three-dimensional microfluidic channels using soluble wax mold. Using the 3D printing technique, we firstly fabricated three-dimensional mold which consists of soluble wax material. The PDMS pre-polymer is cast around, followed by PDMS casting and curing. The three-dimensional casting mold was removed from PDMS by chemically dissolved with methanol and acetone. In this work, two preliminary experiments were carried out. Firstly, the solubility of several waxes was tested using various solvents, such as acetone, methanol, hexane, and IPA. We found the combination between wax and solvent which dissolves the wax. Next, side effects of the solvent were investigated during the curing process of PDMS pre-polymer. While some solvents let PDMS drastically swell, methanol and acetone let PDMS swell only 2% and 6%, respectively. Thus, methanol and acetone can be used to dissolve wax in PDMS without any serious impact. Based on the preliminary tests, three-dimensional PDMS microfluidic channels was fabricated using the mold which was printed out using 3D printer. With the proposed fabricating technique, PDMS-based microfluidic devices have advantages of fast prototyping, low cost, optically transparence, as well as having complex three-dimensional geometry. Acknowledgements: This research was supported by Supported by a Korea University Grant and Basic Science Research Program through the National Research Foundation of Korea(NRF).

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