Patterning of composite biocompatible microstructures

Technology #2158

Photolithography has long been a common method for microfabrication for MEMS applications. However, these methods typically require the often expensive design and manufacture of customized masks, as well as the extensive time and manual labor associated with using them effectively. These time requirements are only amplified in the fabrication of increasingly composite microstructures, with dozens of distinct materials. This technology is a novel method that combines microfluidic channels with photolithography for the rapid patterning of complex, composite microstructures. This technology provides an expedited, inexpensive, and precise means for fabricating complex patterns of highly composite three-dimensional microstructures.

Microfluidics channel allows for lower costs and higher spatial control and complexity when fabricating microstructures

This technology utilizes a microfluidics channel to deliver a series of photocurable materials to a chamber where photopolymerization under high spatial control is performed with or without the use of masks. The microchannel allows for the rapid delivery of a low volume of reagent to wash away all unpolymerized pre-polymer prior to the subsequent material cycle, without moving fabrication setup, which necessitates realignment. Fabricated microstructures adhere to the bottom of the microchannel and extend to the full height of the microchannel chamber (hundreds of um). Fabricated microstructures are spatially aligned and are suitable for microfluidic manipulation and analysis (e.g., material properties). This reduces fabrication time from hours to minutes and scales linearly with additional materials.

This technology is in the preclinical stage of development and has demonstrated the fabrication of composite three-dimensional microstructures with various geometries, size scales (up to 1 sq. mm), spatial resolution (down to 3um), and materials (up to 24 demonstrated).

Lead Inventor:

Samuel Sia, Ph.D.
Applications:

- Microstructures with spatial material property gradients
- Reduced time and labor in fabrication of MEMS components
- Simultaneous fabrication of all elements of a self-assembling network

Advantages:

- Time-scale of fabrication reduced by orders of magnitude (hours to minutes)
- High spatial resolution over large region (down to 3um and up to 1 sq. mm demonstrated, respectively)
- Method does not require manufacture of potentially costly masks, but is compatible with them
- Number of candidate materials is theoretically unlimited
- Many candidate materials biocompatible

Patent Information:

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Related Publications:


Inventors

Samuel Sia