

Hybrid Subtractive and Additive 3D Processing Using Femtosecond Laser

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Laser processing can be classified into three categories: additive, undeformative, and subtractive manufacturing. Each process has its own advantages and disadvantages. A combination of these manufacturing processes could provide the possibility to diversify the geometry and/or enhance the functionalities of the fabrication targets. In this paper, we propose to combine subtractive and additive manufacturing to enhance performance of femtosecond laser 3D processing for fabrication of highly functional microdevices. The procedure of this hybrid technique consists of two main steps. The first step is to fabricate 3D microfluidic structure in glass microchips by femtosecond laser internal modification followed by wet chemical etching. The second step is to integrate functional microcomponents into the resulting glass 3D microfluidic structure for device functionalization by two-photon polymerization. This technique is then applied to fabricate true 3D biochips with high functionalities for biological studies.



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