3D printed suspended micro-filter integrated in a printed microfluidic channel

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Two Photon Polymerization (2PP) is a powerful additive manufacturing technology already employed in the field of micro-/nano- engineering. The resolution achieved by 2PP 3D printing systems is in the range of hundreds of nanometers, but the printing volume is limited to few mm3 and printing times are not negligible. Therefore, it cannot be considered economically efficient with respect to standard clean room technologies or other Stereolitography (SL) techniques. A possible solution to this limitation is the embedding of micro-/nano- features fabricated by 2PP inside a low-resolution object obtained by SL printers. Moreover, 2PP optimized strategies should be adopted to maximize the resolution and maintain a high printing velocity. In this work, a suspended microfilter obtained by a 2PP system has been successfully integrated in a 3D printed microfluidic structure. The microchannel was fabricated by a standard SL printer using a low-cost 3D printing resin, while the suspended microfilter was obtained using a 2PP Micro-3-Dimensional Structuring System (M3D) and a drop of Femtobond D resin. An innovative printing strategy was carried out to maximize the 2PP resolution and optimize the fabrication time. In particular, the X,Y plan was exploited to build the high resolution mesh, thus obtaining a suspended microfilter that has a final pores size of 4 m on a considerable area of 0.5 mm^2 in an only 30 minutes process. Finally, the microfluidic filtration was efficiency was evaluated employing size-controlled fluorescent microparticles.