PROGRAMMABLE ASSEMBLY OF MICROSTRUCTURES MADE BY TWO-PHOTON POLYMERIZATION

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Hierarchical structures in nature have inspired numerous applications in chemistry, biology, optics, and mechanics, as well as in scientific research and technical implementations [1]. Among many microfabrication techniques, two-photon polymerization (TPP) is a well-established method [2] for creating complex 3D micro-objects with stimuli-responsive and reconfigurable surface properties [3,4]. TPP-based laser printing capillary-assisted self-assembly (LPCS) strategy appears as a prime position technique for fabricating periodic structures [5]. However, up to now the controlled assembly of the pillars has uniquely been employed to create homogeneous arrays or simple text made by standalone pillars (see Figure 1-A). In addition, grayscale two-photon lithography (GTPL) has emerged recently as a method for printing programmable objects by tuning the laser power during the printing process [3]. Inspired by the concept of GTPL, the aim of this work is to tailor the mechanical properties of micropillars to obtain heterogeneous structural assembly. Various assemblies of mono- and multi-material acrylate based micropillars with different configurations can be achieved by adjusting the height, arrangement, laser power and printing speed to guide capillary force (see Figure 1-B).

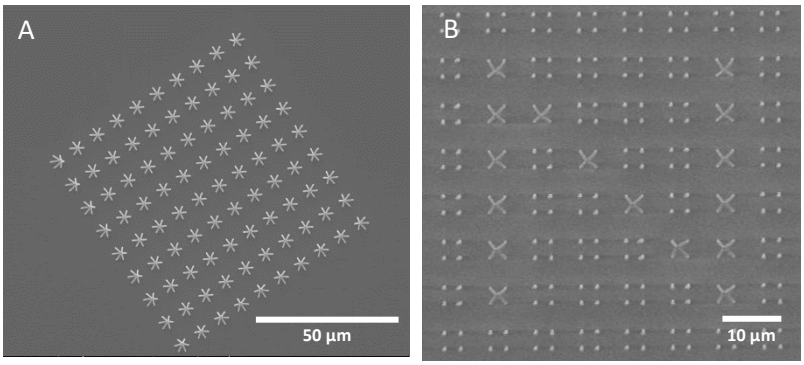

Figure 1: SEM images of micropillars obtained by TPP. (A) Homogeneous capillary self-assembly of pillars in hexagonal arrangement. (B) Heterogeneous structural assembly of micropillars. Letter N inside a CNRS-lettering pillar array.

References

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