Photonic nanojets fabricated by multiphoton polymerization technique

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Microsphere lenses are widely known for being able to focus light beyond the Abbe diffraction limit, a phenomenon known as a photonic nanojet [1],[2]. This work shows how to process novel photonic nanojet generating structures (PNGS) using maskless 3D printing by multiphoton lithography (MPL) and homemade organic-inorganic hybrid material [3]. Since MPL allows the fabrication of true 3D structures on the microscale with sub-100 nm resolution, it is possible to process arbitrary PNGS stacked on top of each other, such as multiple spheres with different diameters or a combination of a Fresnel-lens and a sphere (see Fig. 1). In addition, MPL enables the accurate and repeatable integration of novel PNS into a macroscopic supporting frame for easy manipulation and attachment. Thus, photonic nanojets generated by novel 3D-printed structures will enable fast super-resolution imaging of samples that would otherwise need to be analyzed using time-consuming scanning electron microscopy or atomic force microscopy.

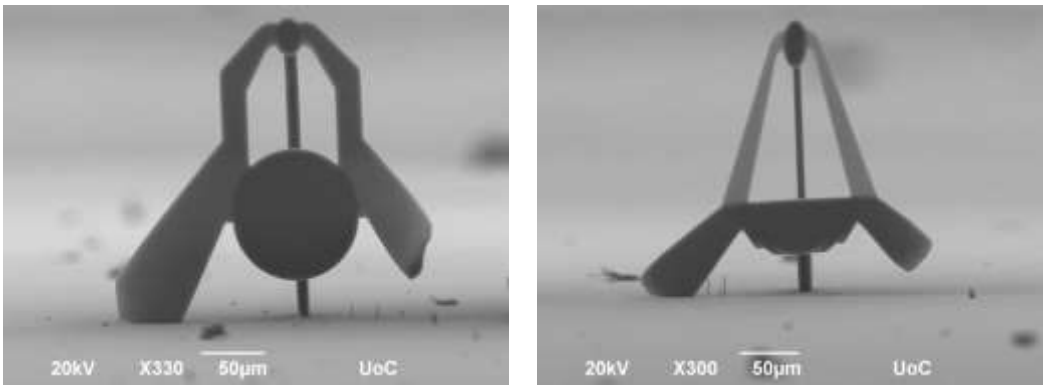

Figure 1: Scanning electron microscope image of the cross-section of photonic nanojet generating structures printed by MPL. The left image illustrates the combination of two spheres with a diameter of 20 µm and 100 µm. The right image shows the combination of a Fresnel-lens and a sphere with a diameter of 20 µm.

References

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