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Supplemental Materials

Reflective Micro-concentrator Arrays from Holographic Photopolymerization: Design, Fabrication and Characterization

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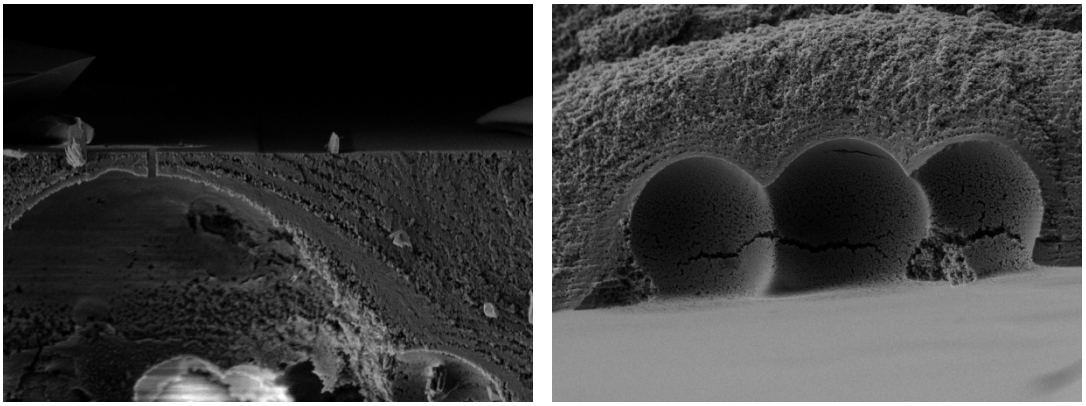

Figure S1. SEM images of the cross-section of concave-shaped grating structures.

The 600 μm diameter microconcentrator fabricated using a 633nm He-Ne laser

In an additional set of experiments designed to demonstrate the tunability of the system, a Helium-Neon laser (at 633 nm) was employed in the holographic photopatterning. In this fabrication, a tellurium containing tetramethylrosamine dye (TMR-Te), with a significant optical absorption at 633nm, was used as the photoinitiator [S1]. Specifically, the solution contained an acrylate monomer (Dipentaerythritol pentaacrylate, ~43 wt %), Liquid Crystal (TL213, n_0=1.527 n_e=1.766, from EMD Industries, Merck, ~20 wt %), photoinitiator: TMR-Te (~0.7 wt%), co-initiator: NPG (~1 wt%), reactive solvent: NVP (~16 wt%), and non-reactive solvent: Toluene (~19.3 wt%). Similar to the characterization discussed in the main text, the illumination of the micro-concentrator array with a white light beam resulted in an array of focusing points being observed using the optical microscope system as shown in Figure S2. As shown in Figure S3(a),

since the illumination wavelength employed in this photopatterning was 633nm, the peak reflection wavelength was shifted to ~560nm, which agrees well with the theoretical prediction assuming the typical 89%~90% shrinkage of the porous materials. The focusing functionality of this concentrator was also characterized by the z-scan microscopy from ($z=z_0$) to ($z=z_0$+260 μm) when the liquid crystal filter was tuned to 560nm, as shown in Figure S3(b). The light beam was focused to a point by the microconcentrator.

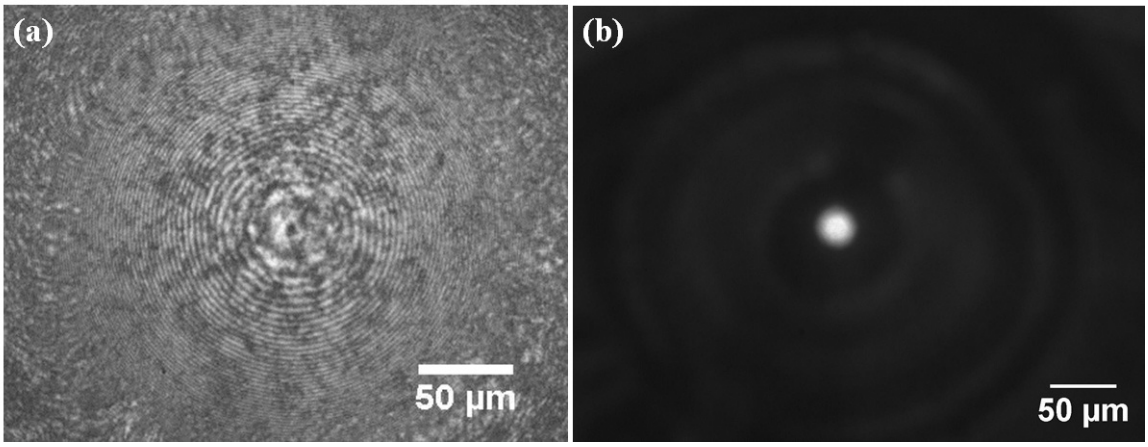

Figure S2. (a) The top view ($z=z_0$) of the micro-concentrator fabricated using a 633nm He-Ne laser. (b) The reflection image at the focusing point ($z=z_0$+260 μm).

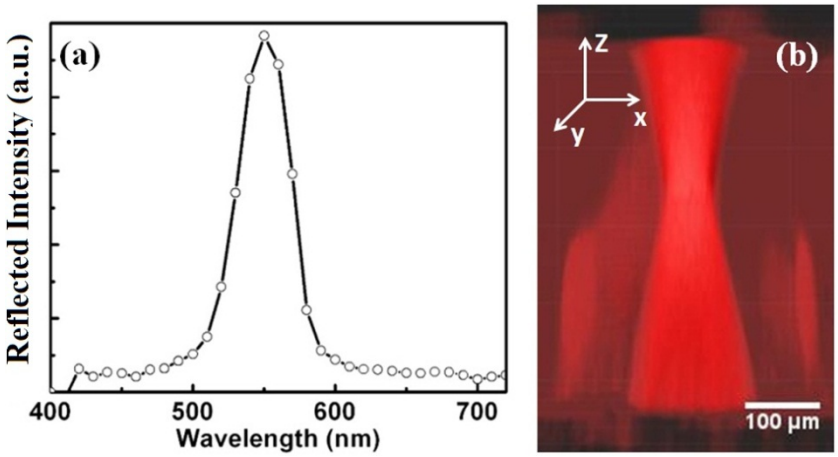

Figure S3. (a) Spectral analysis of the focused spot shown in Figure S2(b). (b) Z-scan image at a wavelength of 560 nm to demonstrate the focused light beam distribution in three-dimensions.

References

[S1] B. Calitree, D. J. Donnelly, J. J. Holt, M. K. Gannon, C. L. Nygren, D. K. Sukumaran, J. Autschbach, and M. R. Detty Tellurium Analogues of Rosamine and Rhodamine Dyes: Synthesis, Structure, ^{125}Te NMR, and Heteroatom Contributions to Excitation Energies, Organometallics **26**, 6248 (2007).