Wavelength-independent and photoinitiator-free multiphoton lithography

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This study explores laser direct writing utilizing Multiphoton Lithography (MPL) technique of hybrid photoresist SZ2080™ without the use of any photoinitiator.[1] We employ various wavelengths, different pulse durations and repetition rates, showcasing the versatility of ultra-precise MPL technique.[2] Remarkably, this method is validated without the use of any photo-initiators, allowing for intricate 3D printing. Our findings reveal the efficacy of wavelengths at 517 nm, 780 nm, and 1035 nm, even at high writing speeds of up to 100 mm/s. Additionally, by varying the organic-inorganic ratio in the hybrid material, SZ2080™, dynamic adjustments in the fabrication window are observed without hindering the photo-structuring process. This controlled energy deposition per focal volume, due to localized heating, ensures efficient 3D printing (see Figure 1). The results of this study not only enhance the capabilities of SZ2080™ but also extends the optical manufacturing capacity to non-photo-sensitive materials, expanding the applications in additive manufacturing.

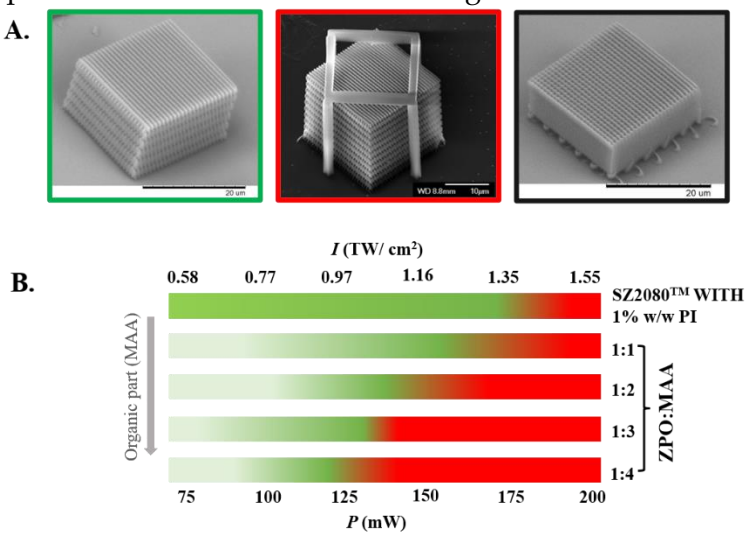

Figure (1): A. 3D woodpile structures fabricated via MPL using a 517nm (green frame), 780nm (red frame) and 1035nm (black frame) wavelength. B. Processing window of the SZ2080™ with 1% w/w photoinitiator (PI) and compared to non-photosensitized SZ2080TM compositions consisting of different concentrations of the organic parts.

References: [1] D. Ladika, A. Butkus, V. Melissinaki, E. Skliutas; [2] H. Wang, W. Zhang, D. Ladika, H. Yu, D. Gailevičius, et al.;