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Ultrafast optical fiber microbeam for in-depth fabrication, trapping and fluorescence excitation MERVYN PINTO, UT Arlington, YOGESHWAR MISHRA, CUSAT, NINAD INGLE, SAMARENDRA MOHANTY, UT Arlington — Micro-focused laser beam is finding widespread application in two-photon polymerization (TPP), microsurgery, two-photon fluorescence microscopy and optical trapping of microscale objects. However, limited by short working distance of the microscope objective, it is essential to develop fiber based laser microbeam for in-depth applications. While fiber-optic two-photon fluorescence excitation (TPE) has been explored in past for endoscopic imaging, only recently we demonstrated optical trapping and microsurgery using single fiber optical microbeam. Here, we present use of ultrafast laser coupled to microfabricated single mode optical fiber for in-depth fabrication of microstructures by TPP as well as TPE and manipulation of microscopic objects by fiber optical microbeam tweezers. The microfabrication of fiber optic axicon tip was optimized so as to perform all the four functions, namely fabrication, excitation, manipulation and collection of fluorescence from the trapped object. Owing to the propagation distance of Bessel-like beam emerging from the axicon-fiber tip, relatively longer streak of fluorescence was observed along the microsphere length. Stable trapping of the fluorescent objects was observed due to reduced scattering force as compared to axial gradient force. These results using multifunctional optical fiber will be presented.

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