# Femtosecond micromachining in polymers

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Innovative polymeric materials are being developed to meet the ever-increasing mechanical, thermal, electrical and optical properties required for a variety of applications, from photonics to biology. Several techniques exist for machining polymers, including laser micromachining, a method whereby a focused laser beam is used to microstructure materials. The use of laser microstructuring has become widespread in the last decade thanks to the range of laser sources available and the flexibility it provides. Recently, femtosecond laser micromachining has received much attention due to its precise ablation capability and its application to a broad range of materials, including semiconductors, metals, glasses and polymers. When fs-laser pulses are focused into a material, the light intensity at the focal volume can become high enough to cause multi-photon absorption, leading to permanent structural changes [1-3]. Because the absorption is strongly nonlinear, this process is localized in the focal volume. Another method been used for the microfabrication in polymers is the so called two-photon polymerization [4]. This method is a powerful tool in the fabrication of three-dimensional microstructures for applications ranging from photonics to biology. In this process, the nonlinear nature of the multiphoton absorption confines the polymerization to the focal volume of the laser, allowing the fabrication of microstructures by moving the laser focus three-dimensionally through the resin. However, most of the microstructures fabricated using fs-laser micromachining are passive - their optical properties cannot be altered by external means. The lack of active elements motivated us to study the microfabrication with special polymeric compositions [5]. In this work, we demonstrate the fabrication of microstructures with optical and biocompatible properties, for a wide range of applications.

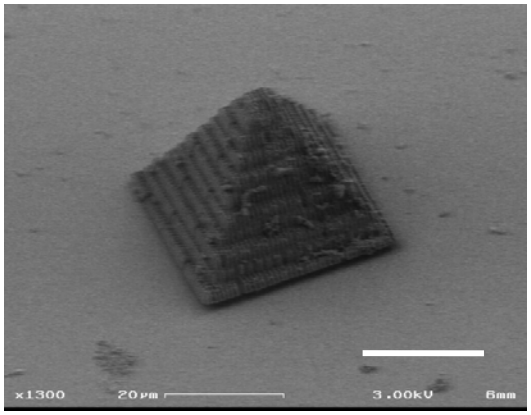


**Figure 1** –Microstructures containing the conjugated polymer MEH-PPV fabricated by two-photon polymerization.

Keywords: two-photon polymerization, femtosecond laser, micromachining.

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