

# Three-dimensional microstructure containing fluorescent material fabricated by femtosecond laser

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**Abstract:** Using the negative photoresist material mixed with Rhodamine 6G, several three-dimensional (3D) microstructures were fabricated by the technology of femtosecond two photons. Laser micro-fabrication is an effective technique, which allows to mark and remove unwanted regions in a few simple processing steps. A parallel fabrication of complex 3D micro-structure are provided by this unique technology. A series of photochemical and physical reactions are stimulated by the femtosecond laser. The solidified size of a micro-structure formed during the photo-polymerisation process can be controlled by adjusting optical fabrication parameters. Various micro-structures can be fabricated based on this theory. The femtosecond laser used in this experiment is Mira-900f (Coherent). The Laser uFAB Micro-fabrication Workstation is provided by Newport company with working wavelength of 780 nm. The 3D micro-structure we fabricated is hexagonal-pyramid, the height and lengths at the bottom of the hexagonal-pyramid are 39  $\mu\text{m}$  and 20  $\mu\text{m}$ , respectively. When the sample was irradiated by the green laser with the emission wavelength of 532 nm, an emission peak is found around the wavelength of 550 nm. In addition, a sample without Rhodamine 6G which has the same 3D microstructures as above is measured under the irradiation of the green laser. Comparing the measured spectrum, it is found that only the sample containing Rhodamine 6G could emit fluorescent. A detailed analysis of their structural and optical properties was presented. The results of our experiment could provide an evidence for the location of the fluorescent material. It may be applied in the field of bioimaging, fluorescent sensor, fluorescent immunization and optical storage materials.

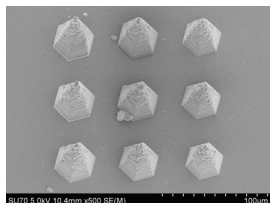


Fig.1 SEM image of Micro-six pyramid array

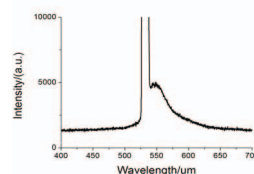


Fig.2 The spectra of hexagonal-pyramid doped with Rhodamine 6G