Fabrication of complex photonic structures with Direct Laser writing system

Rajeshkumar Mupparapu, Silvia Vignolini, Diederik Wiersma.

European laboratory for Non-linear spectroscopy (LENS)

Via N. Carrara, 1. I-50019 Sesto Fiorentino, Firenze, Italy.

rajeshkumar@lens.unifi.it

Light propagation in complex photonic structures is fascinating area of research for its fundamental implications. These kinds of materials have been widely studied to manipulate light propagation through them. Direct Laser Writing (DLW) by two-photon polymerization has emerged as rapid, cheap and flexible fabrication method for the realization of nanostructure materials for photonics applications [1-2]. In DLW method Femtosecond pulses are tightly focused into the volume of photoresist at frequency below the one-photon absorption threshold. The light intensity inside the focal volume exceeds the threshold for initiating the two photon polymerization. The focus of the beam is moved in a preprogrammed pattern to fabricate the designed nanostructures.

In this work we fabricate three dimensional photonic crystals and two dimensional fractal structure using this technique. In particular we realize 3D-woodpiles and we study the light propagation through them in the near-field regime as a controlled amount of disorder is introduced. The near-field characterization of the woodpiles provides both topography and optical information of the realized structures. The far-field diffraction from the Seirpinsky fractal is analyzed as the iterations number is increased.

References:

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