3D Photonic Crystal for Rainbow Trapping Fabricated via Two-Photon Lithography

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The study of photonic crystals (PhC), first proposed in 1987, remains a field of high interest given the wide number of possibilities to control and manipulate the flow of light in different ways, and mostly, given the recent advances on technologies and techniques that allow to realize and test these materials experimentally [1]. One of these techniques is two-photon lithography, which is a well-established Laser Direct Writing technique (LDW) used over the last decades for manufacturing high precision 3D micro and nanostructures [2], and which appears as a suitable and high desirable technique for the fabrication of 3D PhC.

The goal of this study has been to fabricate a 3D PhC able to slow down the light propagation in the visible and near infrared range, and spatially separate its frequency components, leading to the so-called "Rainbow trapping" effect [3], which results in an increase of light intensity chromatically resolved along the crystal, and thus can be used for application in which enhanced light-matter interaction is required.

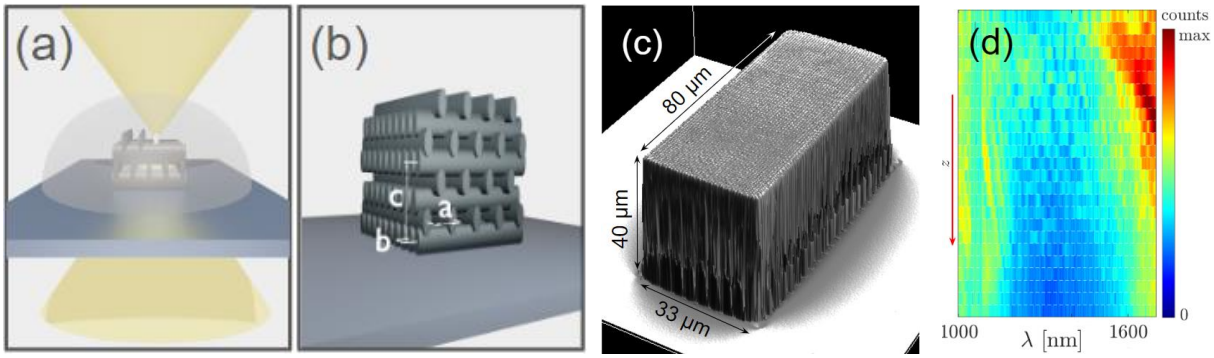

Fig 1. (a) LDW Fabrication. (b) Structure geometry. (c) Sample imaged via optical profilometry. (d) Experimental scattering results showing spectrally dependent light localization.

This effect has been measured by focusing a supercontinuum laser beam inside the structure and spectrally analyzing the light scattered along the crystal with a spatially resolved spectrometer, which gives information about the light localization inside the crystal.

References:

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