

3D photonic crystal woodpile structures out of barium titanate

3D photonic crystal woodpile structures are used to block light of one specific wavelength. This project aims to fabricate this 3D photonic crystal woodpile structure out of barium titanate in the optical wavelength regime by a technique called soft nanoimprint lithography. Soft nanoimprint lithography is a bottom-up technique which is applicable on large scales and which is a low-cost technique. Top-down approaches are challenging and time consuming for materials like lithium niobate or barium titanate as they have a high etch resistance.

The goals for this project are:

- 1) Fabrication of at least eight layers of the 3D woodpile structure.
- 2) Measurement of the linear spectrum
- 3) Measurement of the nonlinear spectrum

The fabrication recipe was already established by a former semester student. This project gives you the possibility to learn the technique of soft nanoimprint lithography and particle solution processing as well as to run a linear and nonlinear optical experiment.

This project is designed for a longer semester project or Bachelor/Master thesis of 6 months or it can be split in two parts (Fabrication/Optical Measurements) for a semester project in the Physics department.

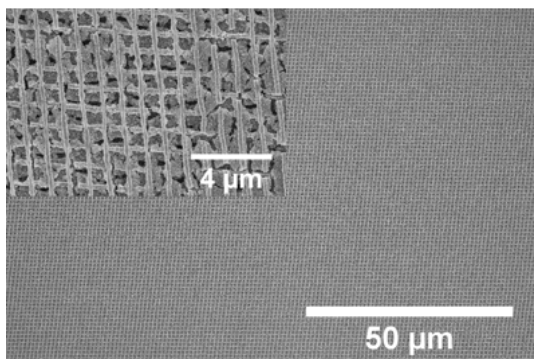


Figure 1 SEM image of a 3D photonic crystal woodpile structure.

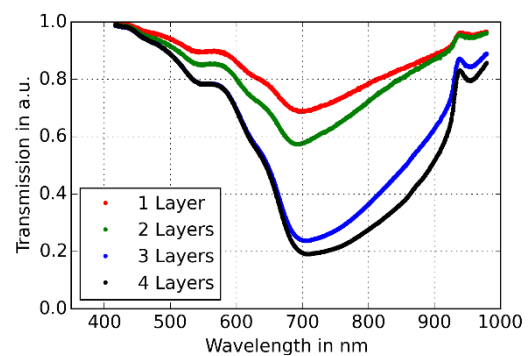


Figure 2 Transmission spectra of one to four layers of the photonic crystal. A band gap is getting formed around 700 nm.

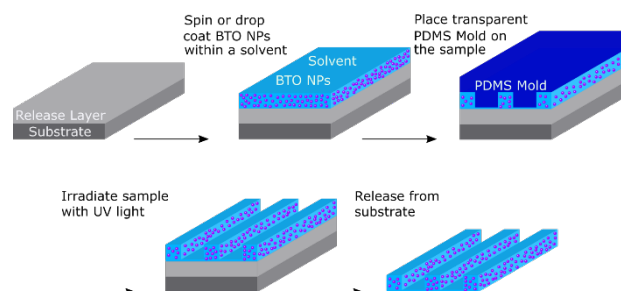


Figure 3 Schematic of soft nanoimprint lithography