Optical Properties of SbSI photonic crystals

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All over the world the investigations of nanophotonic structures called photonic crystals (PCs) are performed. These crystals are promising structures for applications in optoelectronics, e.g. sensors, optical filters, antireflective surface coatings and lossless frequency selective mirrors.

This work is focused on optical investigations of SbSI photonic crystals based on three-dimensional opal template with a closed-packed face centered cubic (fcc) lattice prepared from monodisperse silicon (SiO_2) spheres by gravity sedimentation. Three types of photonic structures have been examined: SiO_2-opals, opals filled with SbSI (direct opals) and inverted opals obtained after removing SiO_2 templates from the SbSI matrixes.

Optical properties were investigated by reflectance spectroscopy for wavelengths from 180 nm to 1700 nm. These measurements exhibit Bragg's peaks connected with photonic band gap that is tunable in position and width by varying the medium filling the opal. Effective refractive indices have been determined on the basis of angular dependences of the Bragg peak positions. Calculated photonic band structure has been compared with the experimental results.

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