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Tunable Mesoporous Defects in Photonic Crystals F.C. PEIRIS, J.R. RODRIGUEZ, Physics, Kenyon College, V. KITAEV, Chemistry, Wilfred Laurier Uni., G.A. OZIN, Chemistry, Uni. Toronto — Similar to doping in semiconductors, the incorporation of defects into photonic crystals introduces defect-based states in the photonic band gap, resulting in an increase in its functionality. In this work, we have introduced a planar-defect into a colloidal photonic crystal, and have investigated the evolution of its optical properties with respect to the infiltration of various foreign constituents. A periodic mesoporous silica film (i.e., the defect) was deposited on a silica-based colloidal photonic crystal, and a second photonic crystal was deposited subsequently to encompass the defect-layer. UV-VIS spectroscopy, scanning electron microscopy and X-ray diffraction experiments confirm the existence of the meso-layer. Subsequently, water vapor and tetramethyl orthosilicate (TMOS) were infiltrated into the structure and the defect-based signature corresponding to the optical spectra was monitored. In both cases, a noticeable shift in wavelength was observed, providing evidence that the structure performs as a chemical sensor.

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