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Tunable Optical Switching/Routing by Negative Refraction in Liquid Crystal filled Opal and Inverted Opal Photonic Crystals RABIA MOUSSA, Nanotech Institute, University of Texas at Dallas, RYOTARO OZAKI, Department of Electrical and Electronic Engineering, National Defense Academy of Japan, A. EFROS, ANVAR ZAKHIDOV, Nanotech Institute, University of Texas at Dallas, DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING, NATIONAL DEFENSE ACADEMY OF JAPAN TEAM, NANOTECH INSTITUTE, UNIVERSITY OF TEXAS AT DALLAS TEAM, NANOTECH INSTITUTE, UNIVERSITY OF TEXAS AT DALLAS TEAM — In this study, we investigate the optical characteristics and negative index of liquid crystal (LC) infiltrated inverse opal as a 3D photonic crystal (PC). We demonstrate that it is possible to achieve a tunable negative, by infiltrating LC into porous synthetic opal and inverted opal type PC. Using the optical anisotropy of LC and field sensitivity, the optical properties of porous PC infiltrated with LC can be easily controlled. The design of a simple and efficient wide angle optical switch/router is considered. Changing the electric field across the LC-PC, with the use of transparent electrodes, the refractive index of Opal-PC can be modulated within several percent, shifting the light beam between photonic bands with negative and positive dispersion. The calculations reveal that LC molecular orientation in the inverse opal strongly influences light propagation in 3D PC.

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