Organic 2D PC Optical Switching with picosecond response

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An all-optical switching with high switch efficiency is realized in terms of the shift of photonic gap edge under ultrafast optical excitation in a two dimensional nonlinear photonic crystal made of polystyrene, which is composed of regular square arrays of cylindrical air holes in 300 nm polystyrene film and prepared by using the focused ion beam etching system. The lattice constant and radius of air hole are 220nm and 90nm, respectively. The prism-film coupling method (with the help of evanescent fields) is used to couple energy of probe light into photonic crystal waveguide and a pump and probe method was applied to measure the transmittance of the probe light. High transmittance contrast of more than 60% is realized for the probe light at two states of “on” and “off “of the switching. Time response of the optical switching is around 10ps, which may be limited by the laser duration. The dynamical shifts of photonic gap induced by pump light are measured and analyzed. The photonic gap shifts 10 nm under the excitation of 16.7GW/cm^2 pump intensity, which is in agreement with the theoretical predictions.