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Wide-Angle Polarization-Dependent Diffraction in a Silicon Nano-Patterned Membrane Reflector ANTON GRIBOVSKIY, TRAVIS MILLER, MALIK RAKHMANOV, Department of Physics & Astronomy, University of Texas at Brownsville, SANTHAD CHUWONGIN, DEYIN ZHAO, WEIDONG ZHOU, Department of Electrical Engineering, University of Texas at Arlington — Silicon nano-patterned membrane reflectors (two-dimensional photonic crystals) are designed for use as broad-band reflectors or narrow-band optical filters and are capable of high reflectivity at selected wavelengths. High-sensitivity off-axis measurements reveal a wide-angle diffraction pattern produced by these reflectors. We conducted experiments using four laser wavelengths: 405, 635, 1064, and 1550 nm. For visible light, the diffraction pattern consists of a two-dimensional array of isolated bright spots. For infrared light, the diffraction changes drastically and a cross-shaped pattern appears in the reflected field. The pattern stretches almost 180 degrees in two orthogonal directions and strongly depends on the polarization of the incident beam. The intensity variations are present in the branch of the pattern which is perpendicular to the polarization of the incident beam. This effect modifies the reflective properties of the nano-patterned membranes and must be taken into account when considering the performance of these devices.

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