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Complete Polarimetry of Nano- and Mesofabricated Lattices

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We recently constructed a Mueller matrix polarimeter of great sensitivity based on four synchronous photoelastic modulators operating at different frequencies [1,2]. Herein, we use this device to analyze a variety of nano- and mesofabricated lattices. In particular, we show that claims of special physics associated with so-called 2D chiral lattices are unfounded when complete polarimetry is employed in the study of nanohole [3,4] and gammadion arrays. Applications to nanofabricated forests of helices are also described.

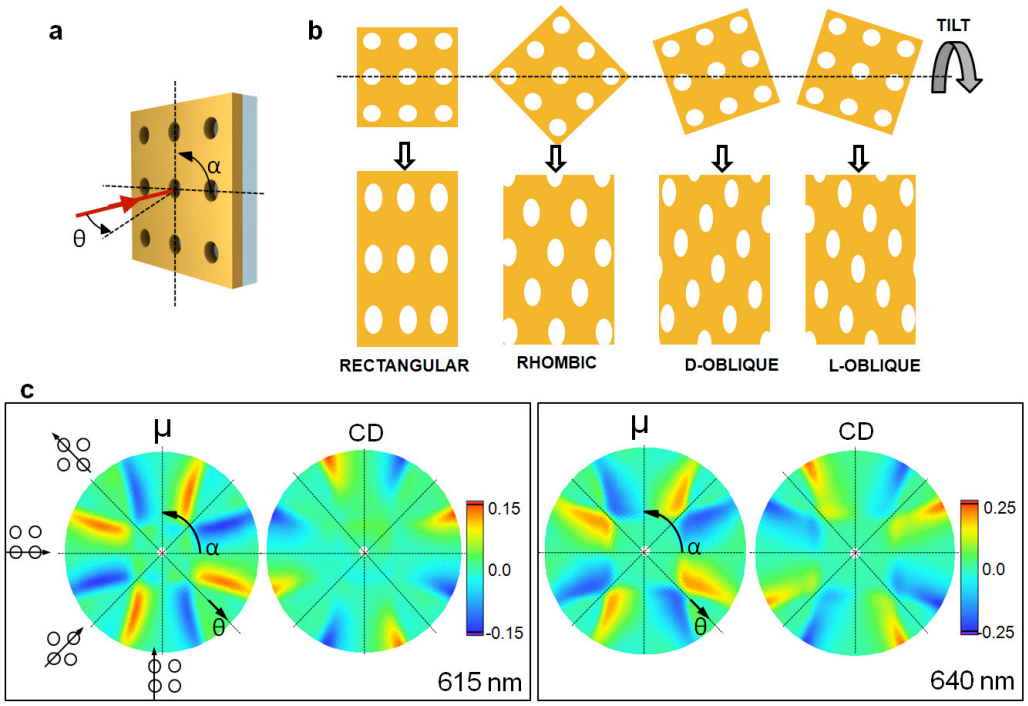

Figure 1 Oblique incidence measurements through gold film (250 μm) with square nanohole array (lattice vector is 530 nm). Angle of incidence θ and azimuthal orientation α (**a**). Lattice projections as function of α and θ (**b**). Polar plots measured at 615 nm and 640 nm showing the evolution of μ (circular extinction) and true CD with α and θ (**c**). Asymmetric transmission (a direct consequence of μ) is only non-zero for values of α in which the square lattice has an oblique projection.

Reference:

[1] O. Arteaga, J. Freudenthal, B. Wang, B. Kahr, Mueller matrix polarimetry with four photoelastic modulators, *Appl. Opt.* **51**, 6805-6817 (2012).
[2] S. M. Nichols, J. H. Freudenthal, O. Arteaga, B. Kahr, Imaging with photoelastic modulators *SPIE Sensing Technology+Applications*, 909912-909912-10 (2014).
[3] O. Arteaga, B. M. Maoz, S. M. Nichols, G. Markovich, B. Kahr, *Complete* polarimetry on the asymmetric transmission through sub-wavelength hole arrays, *Optics Express,* **22**, 13719-13732 (2014).
[4] S. M. Nichols, O. Arteaga, B. M. Maoz, G. Markovich, B. Kahr, Polarimetric analysis of the extraordinary optical transmission through subwavelength hole arrays, *SPIE NanoScience+ Engineering*, 91631W-91631W-10 (2014).