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Photoisometric liquid crystals integrated with plasmonic nano-structures GARY WALSH, Electrical Engineering Boston University; US Army NSRDEC, SYLVANUS LEE, Mechanical Engineering Boston University, BRIAN KIMBALL, US Army NSRDEC, LUCA DAL NEGRO, Electrical Engineering and Materials Science Boston University — Optically switching photoisometric liquid crystals can be used for a variety of applications. However, the dependence of the efficiency of photoisometric processes on optical fluence requires power levels too high for many practical applications. Recently it has been shown that symmetry breaking in deterministic aperiodic plasmonic nano-structures boosts the efficiency of nonlinear processes by producing significant spatial field localization. This technology has the potential to dramatically enhance the performance of photoisometric liquid crystal devices. In this work, we combine photoisometric liquid crystals with lithographically fabricated periodic and aperiodic plasmonic nano-particle arrays in microfluidic channels to enhance their all optical switching properties. Using rigorous analytical multiple scattering methods we engineer particle arrays for near field enhancement at a control wavelength and the diffraction properties of a probe beam at another. Optical pump probe measurements of retardance and absorption are used to characterize the liquid crystal's structure factor as function pump power. The effects of plasmonic particle arrays on the switching dynamics on the photoisometric liquid crystals are also experimentally explored.

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