Laser tweezing in liquid crystal systems.
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Trapping and moving micron-sized particles in liquid crystalline systems with lasers is a beautiful approach that can build novel colloidal photonic materials as has been shown by the elegant work of Musevic et al. However, it is also a unique way of studying fundamental LC properties, particularly anisotropic viscosity coefficients in the low Ericksen regime, which can be accessed by laser trapping.

Micron-sized LC droplets are emerging as intriguing photonic systems in their own right. Angular momentum can be transferred from laser traps to droplets, specific polarization properties and droplet geometries resulting in a variety of novel photon-driven effects. Fast optical switches, rotating at speeds >1kHz, can be produced from nematic droplets in circularly polarized beams. Both droplet geometry and beam polarization influence the droplet rotation, allowing control of the phenomenon. Surprisingly, a chiral nematic droplet can sometimes undergo continuous rotation in a linearly polarized trap, a phenomenon caused by optically-induced changes in chirality. We describe the various approaches to optical addressing of liquid crystal droplets using laser tweezers that could result in all-optical switches and transducers.

References