# Liquid crystal colloidal structures as photonic materials

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Liquid crystal colloids are interesting for a variety of mechanisms –including self-assembly, optical-tweezers assisted assembly, activity, topology, and material flow - that can be used to create various complex optical and photonic structures. Here, we present various liquid crystal colloidal structures, as recently achieved by numerical modelling and experiments that show potential for application in complex optics and photonics. Central to the structures are complex conformations of topological defects, as they can bind, stabilise, or distort the structure. More specifically, we show the assembly of 2D and 3D colloidal crystals, entangled structures, knotted defects, knotted particles and quasicrystalline tilings. Further we show selected use of these structures as photonic elements, including tuning of photonic bands via symmetry of soft matter components and control and design of vector laser beams of various charge by coupling with nematic defects.

Selected related references:

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