

Swelling cholesteric liquid crystal shells to direct colloids at the interface

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Cholesteric liquid crystals can exhibit spatial patterns of molecular alignment at interfaces that can be exploited for directed particle assembly. These patterns emerge from the competition between bulk and surface energies, tunable with the system geometry. In this talk, I will demonstrate how the system geometry can control the kinetic arrest of particles. The osmotic swelling of cholesteric double emulsions changes the energy landscape to assemble colloidal particles through a pathway-dependent process. Particles can be repositioned from a surface-mediated to an elasticity-mediated state through dynamically thinning the cholesteric shell at time scales comparable to those of particle attachment. By tuning the balance between surface and bulk energies with the system geometry, colloidal assemblies on the cholesteric interface can be molded by the underlying elastic field to form linear assemblies. The transition of attached particles from surface regions with homeotropic anchoring to defect regions is accompanied by a reduction in particle mobility. The arrested assemblies subsequently map out and stabilize topological defects. These results demonstrate the kinetic arrest of interfacial particles within definable patterns by regulating the energetic frustration within the system. This work highlights the importance of kinetic pathways for particle assembly.