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"Imperfections in soft matter: A new toolkit to direct assembly of advanced materials"

Abstract: The opportunities for guiding assembly using energy stored in soft matter are wide open. The emerging scientific frontiers in this field show an exceptional promise for significant new applications. Since soft materials can be readily reconfigured, there are unplumbed opportunities to make responsive devices with tunable properties. Liquid crystals (LCs) constitute a fascinating class of soft matter characterized by the counterintuitive combination of fluidity and long-range order. These materials are known for their exceptionally successful applications in displays, smart windows, and biosensing applications. When the order of molecules in some local regions of LCs is not well defined, topological defects form. These defects are strong trapping sites for colloidal inclusions and have been widely used to control their assembly. In this talk, I present few examples where I use defects in LCs as a platform to directed the assembly of colloidal inclusions. In the first system, defects created at distinct locations in nematic films and emulsions are explored to guide the assembly of microparticles into rich 2D structures. In the second system, defects in a smectic liquid crystal, known as the focal conic domains (FCDs), are created on curved interfaces to self-assemble into a highly ordered structure named the flower texture. These flowers are capable of focusing light and act as micro-lenses similar to an insect's compound eye. In the last system, the 3D network of defects in cholesteric blue phases is explored to arrange gold nanoparticles into cubic colloidal crystals that are tunable and thermally reversible. I will present recent progress in understanding the mechanisms that govern the formation of theses assemblies and will report how defects in soft matter can inspire strategies for making a new generation of advanced materials.

Wednesday, February 8, 2017
4:00 pm, Room S-122, Sackler Sciences Center