Heterogeneous liquid crystals and the control of solubility.

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Summary: Investigate the factors that control miscibility in organic systems with the aim of inventing novel devices based on light and field induced reversible changes in liquid and liquid crystal systems.

Polymer dispersed liquid crystals are now well known for use in privacy screens and simple plastic displays. They rely on the solvent, thermal or photo induced phase separation of a monomer mixed into a liquid crystal. As the monomer polymerizes the liquid crystal forms droplets in the polymer matrix, which can be used to create scattering that may be modulated through the application of an applied electric field.

This project aims to develop novel devices applicable far more widely than this current technology. It will begin by understanding the mechanisms for phase separation, including controlling the size of the droplet, surface enhanced nucleation, and novel systems for reversible solubility.

Hence, it is envisaged that plastic films that can act as controllable phase modulators will be created that are suitable for adaptive optics, micro-lenses and other optoelectronic components. Reversible systems, where the miscibility can be controlled by the application of light or electric field have enormous potential for applications in smart windows, and novel optical devices.