**Polymer stabilization of liquid crystal structures and phases**

Ingo Dierking

*Department of Physics and Astronomy, University of Manchester, Oxford Road, Manchester M13 9PL, United Kingdom*

Polymer stabilized liquid crystals are formed by subjecting a small amount of bifunctional photoreactive monomers, uniformly dissolved with a photo-initiator in a liquid crystal host, to UV irradiation. The formed polymer network templates the liquid crystal director field in which it was formed, thus stabilizing the structure. The effect of stabilization depends largely on the monomer concentration, the solubility limit of the monomer in the liquid crystal, but also on applied conditions during network formation, such as temperature, time of irradiation, UV intensity and dose. Polymer modified liquid crystals in general are promising materials for a range of electro-optic and photonic applications, for example paper-like reflective displays with flexible substrates, privacy windows or foils, self-healing ferroelectric liquid crystal devices, Kerr effect based fast switching Blue Phase displays, or smart windows, reflecting light in the visible or the IR region.

We will discuss polymer stabilization for several different liquid crystal phases and structures, demonstrating the imaging of director fields via topological defects. We will further show the formation of helical polymer networks, which are used in reflective displays, privacy windows and smart windows for energy saving. Plywood structures are demonstrated resulting from twist grain boundary phases, which are similar to biological systems. At last, we will discuss the performance and principles of polymer stabilised Blue Phases for novel, fast switching display applications in devices without orientation layers.

It is concluded that polymer modified liquid crystals do not only show potential for fundament research, but also open the door to a wealth of applications ranging from electro-optic devices to photonics, from optical to energy saving technologies.