

Oscillatory Dynamics in Liquid Crystal Network Films and Coatings

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Since the development of the reactive mesogens (RM's) in the late 80's of last century they have proven their utility for a wealth of applications. The molecular liquid crystal order frozen in a polymer network brought a new dimension to liquid crystal technology. Initially developed for their use as low shrinkage, low thermal stress coatings, the RM's soon demonstrated their advantages also for optical applications. The large, temperature-stable and adjustable birefringence proved to be a useful instrument for the display industry which adopted the RM's for many purposes, varying from viewing angle enhancement to optical-retarder based 3D imaging optics. Presently, advanced optical applications for augmented reality and astronomy lenses are drawing much attention as well their use to stabilize special liquid crystal effects for smart windows and dedicated display types.

The use of RM's for soft robotics applications is nowadays studied by many academic and industrial institutes. Typically, they are polymers that change their shape, their surface structure or their porosity. At Eindhoven University, we developed self-sustaining oscillators and micro-transport devices responding to triggers as heat, light and/or electrical fields. Films may deform from a flat to a complex, but pre-designed, shape with prospects to light-triggered origami and self-folding plastic elements. A completely new development relates to coatings that switch their surfaces from basically flat to corrugated with a controlled topography, thus controlling properties as friction and grip. The lecture will discuss our newest developments, giving a preliminary view on the future of RM's with advanced applications in the fields of smart coatings, soft robotics and haptics.

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