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## Dirk J Broer

*Eindhoven University of Technology, The Netherlands*

### Liquid crystal polymer networks: A versatile material for advanced optics and mechanics

The molecular liquid crystal order locked in a polymer network by photopolymerization brought a new dimension to liquid crystal technology. Initially developed as low shrinkage, low thermal stress coatings, RM's soon demonstrated their function for optical applications. The large, temperature-stable and adjustable birefringence proved to be ultimately useful 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 non-display applications is studied by many academic and industrial institutes. Typically, they are polymers that change shape, surface structure or 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. And coatings are developed that can dynamically absorb or secret liquids. 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.

#### Speaker Biography

Dirk J Broer is specialized in polymer science and liquid crystal technology. He joined Philips (Eindhoven, Netherlands) in 1973 developing materials for data storage, telecommunication and display optics. In 2003 he was appointed as vice president Philips Research and from 2010 fulltime professor at Eindhoven University of Technology coordinating a program on responsive soft materials. He is member of the Royal Netherlands Academy of Arts and Sciences. In total, he has 275 publications in peer reviewed journals and more than 120 US patents.

[e: d.broer@tue.nl](mailto:d.broer@tue.nl)



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