# Photopolymerization of liquid crystal networks as a tool for micro- and nano-structuring

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In-situ photopolymerization of liquid crystalline (LC) monomers has proven to be a valuable technique for the formation of well-ordered polymer networks [1]. Their anisotropic properties led to a variety of applications in optics [2,3], electronics [4] and mechanics [5]. The use of light to initiate polymerization enables lithographic approaches to pattern the polymers [6]. The LC behaviour enables formation of complex morphologies on a molecular level, especially if combined with surface boundary conditions, chirality and polymerization-induced diffusion. The combination of top-down lithography with bottom-up self-organization accommodates a wealth of applications that even are not fully explored yet.

Photopolymerization initiated by means of a dichroic photoinitiator provides an additional degree of freedom in controlling the structure of LC networks formed. The photoinitiator adapts the director profile of the LC monomer. As a result planar oriented areas aligned orthogonal to the light beam polymerize faster than the parallel ones. Similarly, planar aligned areas with their orientation parallel to the electrical field vector of the light polymerize faster than the planar aligned areas oriented perpendicular to that. Based on this principle complex lithographic structures are build, not only forming structures in the plane of the polymerizing film but also in the third dimension along its cross-section.

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