

## Rudolf Zentel

Department of Chemistry, J.G. University Mainz, D-55099 Mainz (Germany)  
zentel@uni-mainz.de

### From early LC-polymers, via different types of LC-elastomers to actuating LC-particles

Rudolf Zentel started his work on liquid crystalline (LC) materials during his master thesis on the newly (by H. Finkelmann and H. Ringsdorf) invented LC-side chain polymers in 1979 [1]. After his PhD he shifted to LC-elastomers, for which he extended the LC-side chain polysiloxanes (Finkelmann) to polyacrylates -but also LC-main chain- polymers [2]. In addition he introduced chiral phases like cholesterics and the ferroelectric sc\* phase [3] into LC-elastomers (for a summary see [4, 5]. In this way elastomers with polar, ferroelectric properties can be obtained. For an overview about special properties of different smectic LC-polymers see ref. [6] and for the coupling of LC-phases and crosslinking see [7]. Finally he focused from 2010 onwards on actuating LC-particles, which can be made in large quantities with microfluidics [8, 9, 10] and the applications of these microparticles, which might have quiet complex structures (fibers, tubes, balloons/hollow spheres).

Independent on the classical mesogenic systems -used also in the LC-polymer discussed above- it should be considered that anisotropic nanoparticles (e.g. inorganic nanorods) can act as mesogens themselves and self-assemble into an LC-phase [11, 12]. In this way an orientation of the nanoparticles over macroscopic distances is well possible.

For a complete overview on his research topics (also NOT-LC related) see [13]).

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