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Highly viscous liquid crystalline mixtures: the alternative to liquid crystalline elastomers PETR SHIBAEV, CRISTINA SCHLESIER, LEAH NEWMAN, SCOTT MCDONALD, Fordham University, Department of Physics — Novel highly viscous liquid crystalline materials based on mixtures of glass forming oligomers and low molar mass liquid crystals were recently designed [1, 2] and studied. In this communication the novel data are presented, the analysis and discussion are extended. It is shown that viscoelastic properties of the materials are due to the physical entanglements between cyclic oligomers and low molar mass mesogens, not due to the chemical crosslinks between molecular moities. However, the mechanical properties of these viscoelastic materials resemble those of chemically crosslinked elastomers (elasticity and reversibility of deformations). The properties of chiral and non-chiral materials loaded with ferromagnetic nanoparticles are discussed in detail. Cholesteric materials undergo gigantic color changes in the wide spectral range under the deformation that allows distant detection of deformation and determination the anisotropy of deformation and its type. The materials doped with laser dyes become mechanically tunable lasers themselves and emit coherent light while pumped by external laser. A simple model is suggested to account for the observed effects; physical properties of the novel materials and liquid crystalline elastomers are compared and discussed.

[1] P.V. Shibaev, C. Schlesier, R. Uhrlass, S. Woodward, E. Hanelt, Liquid Crystals, 37:12, 1601-1604
[2] P.V. Shibaev, P. Riverra, D. Teter, S. Marsico, M. Sanzari, V. Ramakrishnan, E. Hanelt, Optics Express, 16, 2965 (2008)

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