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Self-assembly of nematic liquid crystal elastomer filaments[1] WEI-SHAO WEI, University of Pennsylvania, Department of Physics and Astronomy, YU XIA, SHU YANG, University of Pennsylvania, Department of Materials Science and Engineering, A. G. YODH, University of Pennsylvania, Department of Physics and Astronomy — In this work we investigate the self-assembly of nematic liquid crystal polymer (NLCP) filaments and their corresponding cross-linked elastomer structures. Specifically, by fine-tuning surfactant concentration, prepolymer chain length, and temperature within a background aqueous phase we can generate filaments composed of oligomerized LC monomers. Filaments with narrowly dispersed diameters ranging from one hundred nanometers to a few micrometers can be obtained. Using polarization optical microscopy, we show that the nematic LCs within the filaments have an escaped radial structure. After photo-cross-linking, nematic liquid crystal elastomer filaments are obtained with well-maintained directors and smooth surface structure. Since these materials are elastomers, the size and mechanical and optical response of the filaments can be "tuned" near the nematic to isotropic phase transition temperature.

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