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Active Liquid Crystals with variable Elasticity NITIN KUMAR, RUI ZHANG, University of Chicago, JENNIFER ROSS, University of Massachusetts, Amherst, JUAN DE PABLO, MARGARET GARDEL, University of Chicago —
Actin filaments driven by myosin motors provide an ideal system to study active matter. We perform experiments on a quasi-two-dimensional sheet of actin filaments ranging from 1 - 10 μm in length. The addition of myosin II motors to a dense sheet of short filaments ($<$2 μm) results in extensile flow patterns and nematic defect propagation, characteristics of an active liquid crystal. We form liquid crystals with variable actin filament length and find that the shape of $+1/2$ defect changes from *circular* to *triangular* as the filament length is gradually increased. By comparing the experimental shapes with simulations, we show that the filament length controls the relative values of splay and bend elastic moduli in the liquid crystal. We find that another means to tune liquid crystal elasticity is through the addition of microtubules. We also show that the orientation and velocity correlation lengths in the active nematic phase scale linearly with the activity, consistent with our simulation results. Our experiments demonstrate active liquid crystals with tunable elasticities.

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