Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Seminar

"Catapulting" of topological defects through elasticity bands in active nematics

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Local injection of energy in active liquid crystals (LC) results in spontaneous defect generation and emerging complex flows. Elucidating the role of competition between activity and nematic elasticity is crucial to understanding this phenomenon. In this talk, I will present our experimental results on nematic LCs composed of short actin filaments, driven by myosin motors where the elasticity is tuned by varying the filament length, l. We find that for l = 2 μm where the elasticity is high compared to an LC with l = 1 μm, elongated regions of uniform bend distortions form, which we define as elasticity bands. The bands are evocative of domain walls which precede the defect generation, observed in hydrodynamic simulations of active nematics. They even undergo branching leading to spectacular structural deformations in the nematic director field which is otherwise unimaginable in equilibrium nematics. Moreover, we find that as the activity decays, the LC dissipates excess elastic energy by eliminating these bands. This results in "catapulting" of +1/2 defects at a very high speed which scales inversely with the width of the band. Altogether, these experiments highlight the importance of the role played by equilibrium material property on emerging complex flows in active materials.

Thursday, Jan 24th 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TIFR-H