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Carbon Nanotube Liquid Crystals: Nematic Droplets and Coarsening Dynamics NATNAEL BEHABTU, Rice University, BOHDAN SENYUK, IVAN SMALYUKH, University of Colorado Boulder, MATTEO PASQUALI, Rice University — On a fundamental basis, carbon nanotubes (CNTs) offer a new model molecule to explore the dynamics and phases of rigid rods and test theories. Their large aspect ratio (100 to 100,000) and persistence length ($\sim$ 100 microns) allow exploring the physics of nematic phases with high Frank elastic constant. Moreover, understanding of CNT liquid crystals is key to their rational processing into ordered materials such as fibers. Here we report the formation of elongated nematic droplets of CNTs in chlorosulfonic acid. In nematic droplets, a continuous transition from a homogeneous to bipolar nematic director field is expected theoretically, as a function of droplet volume; yet, experimental determination of such transition has been elusive. We show that CNT nematic droplets display such transition. We study the coarsening dynamics of positive and negative nematic droplets and observe that two or more droplets merge by matching their nematic director. Merging scenarios that lead to defect formation are not observed. Negative tactoids (isotropic phase in liquid crystalline continuum) merge through attractive forces induced by the nematic director distortion with quadrupolar symmetry.

Natnael Behabtu
Rice University

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