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Dendritic Patterns in Nematic Liquid Crystal Nanocomposites
SEBASTIAN GUREVICH, ALEJANDRO REY, McGill University — Liquid crystal (LC) mixtures with nanoparticles (NP) are of fundamental interest in the development of advanced materials. Of particular interest is developing means to direct the assembly of the NPs. The interactions in LC-NP mixtures are still under active research, although important tendencies have been established. Little attention has been given to morphological instability patterns, and those mediated by diffusion of NPs are yet to be explored. Using the continuum model of Soule et al [1], we explore numerically the growth of nematic droplets in an isotropic liquid under conditions that lead to a variety of dendritic like morphologies controlled by a diffusive instability mediated by the NPs and the anisotropy of the nematic field. The numerical implementation of the model, which represents a mixture of calamitic nematic LC (cylinders) and NPs (hard spheres) of comparable size, is based on the adaptive mesh refinement scheme developed by Provatas et al, allowing access to realistic time and length scales. Our work lays the ground to developing new means to direct the assembly of NPs over large areas by exploiting the morphological instabilities at nematic-isotropic interfaces. The diversity of morphologies may also allow estimating the value of material parameters that are otherwise difficult to obtain experimentally. [1] Soft Matter, 2012, 8, 2860

Sebastian Gurevich
McGill University

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