Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Field-driven dynamics of microcapillaries filled with nematic liquid crystal[1] FRED FU, POUYA KHAYYATZADEH, NASSER M ABUKHDEIR, University of Waterloo — Polymer-dispersed liquid crystal (PDLC) composites have long been a focus of study for their unique electro-optical properties and the feasibility of manufacturing them on a large scale, resulting in applications such as switchable windows. LC domains within PDLCs are typically spheroidal, as opposed to rectangular in LCD technology, and thus exhibit substantially different behaviour in the presence of an external field. In this work, continuum simulations were performed in order to capture the complex formation and electric field-driven switching dynamics of approximations of PDLC domains. A simplified elliptic cylinder (microcapillary) geometry is used and the effects of varying aspect ratio, surface anchoring, and external field strength were studied using the Landau–de Gennes model. The observed nematic formation and reorientation dynamics were found to be governed by the presence and motion of defects within the domain. Aspect ratio was found to strongly influence domain texture by providing regions of high curvature to which defects are attracted. Simulations also predict the presence of a geometry-controlled transition from nematic order enhanced by an external field (low aspect ratio) to nematic order frustrated by an external field (high aspect ratio).

[1]This work was made possible by the Natural Sciences and Engineering Research Council of Canada and Compute Ontario.

Fred Fu
University of Waterloo

Date submitted: 03 Nov 2015 Electronic form version 1.4