Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Field-induced orientational order of liquid crystals in random environments[1] LENA LOPATINA, JONATHAN SELINGER, Liquid Crystal Institute, Kent State University — Over the last twenty years, there has been extensive theoretical and experimental work on liquid crystals in disordered polymer networks and other random environments. It was shown that the disordered environment disrupts the long-range order of the liquid crystal. Recently, D.-K. Yang has performed new experiments, in which an electric field is applied to the polymer-disordered liquid crystal, leading to a large Kerr effect, i.e. field-induced long-range orientational order [1]. This experimental approach offers new opportunities for liquid-crystal displays. To understand the experiments and improve the applications, we perform Monte Carlo simulations of a nematic liquid crystal in a disordered polymer network. These simulations show the formation of randomly oriented domains of uniform directors. We study the response to an applied field by calculating the Kerr coefficient for variable system parameters. Furthermore, using an Imry-Ma-like approach we predict the domain size as a function of temperature and material properties of the system, and estimate the induced orientational order parameter due to an electric field. The simulations and analytic results agree well with each other and with the experiments.

[1] Y.-C. Yang and D.-K. Yang, Appl. Phys. Lett. 98, 023502 (2011).

[1]This work was supported by NSF DMR-1106014.

Lena Lopatina
Liquid Crystal Institute, Kent State University

Date submitted: 28 Nov 2011 Electronic form version 1.4