Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Glassy correlations and thermal fluctuations in nematic elastomers BING LU, Department of Physics and Institute for Condensed Matter Theory, University of Illinois at Urbana-Champaign, XIANGJUN XING, Department of Physics, Syracuse University, FANGFU YE, PAUL GOLDBART, Department of Physics and Institute for Condensed Matter Theory, University of Illinois at Urbana-Champaign — By means of the vulcanization theory framework we address the properties of nematic elastomers prepared in the isotropic liquid state and subsequently randomly cross-linked beyond the gelation point. We base our analysis on a model replica Landau free energy, in which the vulcanization order parameter is coupled to the order parameter describing the local degree of nematic ordering, retaining fluctuation terms to the Gaussian level. We explore how the cross-linking renormalizes the thermal correlations of the local nematic order, and also results in frozen-in, glassy nematic correlations. We examine these thermal and glassy correlations for two different preparation histories of the system: in the first, the cross-linking is done at temperatures close to the isotropic-nematic transition; in the other, the cross-linking is done at higher temperatures, but the system is subsequently cooled to near this transition temperature.

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Date submitted: 17 Nov 2009 Electronic form version 1.4