

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Semi-soft Nematic Elastomers and Nematics in Crossed Electric and Magnetic Fields¹ FANGFU YE, University of Pennsylvania, RANJAN MUKHOPADHYAY, Clark University, OLAF STENULL, University of Duisburg-Essen, TOM LUBENSKY, University of Pennsylvania — Ideal nematic elastomers exhibit soft elasticity in which an elastic modulus of a uniaxial solid vanishes and in which it takes no stress to produce strains, up to a critical strain, in the direction perpendicular to the uniaxial direction. Elastomers crosslinked while stretched exhibit semi-soft elasticity with a nearly linear stress-strain curve at small strain followed by a nearly flat stress-strain relation up to a critical strain. Semi-soft elasticity above the so-called mechanical critical point, which terminates the line of coexistence of nematic phases, has not been established. We calculate global phase diagrams and stress-strain curves for a series of models, including a generalization of de Gennes-Maier-Saupe (dGMS) model and the neoclassical model for nematic elastomers, and demonstrate that semi-soft behavior can persist well above the mechanical critical point. The dGMS model also describes a normal nematic in perpendicular electric and magnetic fields and exhibits a Blume-Emery-Griffiths tricritical point topology.

¹Supported in part by NSF grant DMR04-04670.

Tom Lubensky
University of Pennsylvania

Date submitted: 08 Nov 2006

Electronic form version 1.4