Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

The elastic Maier-Saupe-Zwanzig model and some properties of nematic elastomers[1] DANILO LIARTE, SILVIO SALINAS, CARLOS YOKOI, University of Sao Paulo — We introduce a simple mean-field lattice model to describe the behavior of nematic elastomers. This model combines the Maier-Saupe-Zwanzig approach to liquid crystals and an extension to lattice systems of the Warner-Terentjev theory of elasticity, with the addition of quenched random fields. We use standard techniques of statistical mechanics to obtain analytic solutions for the full range of parameters. Among other results, we show the existence of a stress-strain coexistence curve below a freezing temperature, analogous to the P-V diagram of a simple fluid, with the disorder strength playing the role of temperature. Below a critical value of disorder, the tie lines in this diagram resemble the experimental stress-strain plateau, and may be interpreted as signatures of the characteristic polydomain-monodomain transition. Also, in the monodomain case, we show that random-fields may soften the first-order transition between nematic and isotropic phases, provided the samples are formed in the nematic state.

[1]Financial support of the Brazilian agency CNPq.

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Date submitted: 18 Nov 2010 Electronic form version 1.4