Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Synthesis of Optimal and Imperfect Main Chain Smectic Elastomers HARSHAD PATIL, RONALD HEDDEN, Penn State University — Liquid crystalline polymers (LCPs) and elastomers (LCEs) are mesomorphic polymers that exhibit unique rheological characteristics. Smectic LCE, rubber-like materials which exhibit lamellar mesophases, exhibit high values of the mechanical loss factor (tan delta) over several decades of frequency. We are designing a model LCE system for study of the underlying molecular-level relaxation mechanisms responsible for this broad spectrum of relaxation times. We seek to distinguish to what extent the dynamic evolution of defects (e.g. focal conic defects and dislocations) contributes to the broad loss spectrum, as opposed to other ordinary processes such as relaxation of dangling and free chains. We are studying main chain, smectic LCPs and LCEs consisting of alternating flexible siloxane segments and mesogens. Elastomers are prepared by a three-monomer (A2 + B2 + A4) non-linear polycondensation. Synthetic methods are needed to prepare "optimal" and "imperfect" networks by introducing controlled amounts of dangling and free chains, and to control the phase behavior of the networks through mesogen chemical structure and crosslinking. Dynamic mechanical behavior of model networks, in conjunction with X-ray and neutron scattering studies, will distinguish the underlying physical processes responsible for the broad loss spectrum in smectic LCE.

Ronald Hedden
Penn State University

Date submitted: 02 Dec 2006 Electronic form version 1.4