Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Shape and Memory in Liquid Crystalline Elastomers ANSELM GRIFFIN, WANTING REN, PHILIP MCMULLAN, WHITNEY KLINE, MOHAN SRINIVASARAO, Georgia Tech — As part of an ongoing effort to understand the origins of shape memory in liquid crystalline elastomers (LCE), we have synthesized and examined a series of SmC main-chain LCEs. Uniaxial stretching of these polydomain films at room temperature produces a monodomain structure that can, upon removal of load, retain the monodomain and a significant level of strain. Although these films show ordinary elastic response at temperatures near the isotropization (clearing) temperature, at room temperature – far below the clearing temperature – the mechanical response is anelastic. Experimental studies of isothermal strain recovery vs time after unloading will be presented along with details of the temperature profile for strain recovery of these LCEs. A rationale for the shape memory behavior is proposed that involves moving of crosslink points in the smectic lamellar arrangement during the stretching event and trapping of these crosslinks in different positions at low temperatures. This trapping is driven by the chemical segregation of the crosslink points from the mesogenic unit which can be thermally overcome at elevated temperatures allowing full elastic recovery.

Anselm Griffin
Georgia Tech

Date submitted: 21 Nov 2011 Electronic form version 1.4