Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Controlling the morphology of liquid crystalline block copolymers: interfacial and liquid crystal content effects. ERIC VERPLOEGEN, TEJIA ZHANG, PAULA HAMMOND, MIT — By systematically controlling the covalent attachment of side chain liquid crystals to a block copolymer backbone, the morphology of both the liquid crystalline (LC) mesophase and the phase segregated BCP microstructures can be precisely manipulated. A wide range of morphologies can be achieved from a single block copolymer backbone during a one step LC attachment reaction. The anchoring of the smectic LC mesophase to the inter-material dividing surface (IMDS) is a key driving force in determining the morphologies for both the bulk and in thin films. In thin films the orientation of the morphology is determined by the minimization of the surface energy with the substrate and air interfaces and the anchoring of the LC mesophase to the substrate. These competing effects can be utilized to manipulate the orientation of as-cast and thermally annealed thin films. Additionally, by controlling the LC content, the mechanical properties of this system can be tailored over a several orders of magnitude. The tune-ability demonstrated in this system will allow for custom design and tailoring of material properties for specific applications such as electromechanical and mechano-optical devices.

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Date submitted: 25 Nov 2007 Electronic form version 1.4