Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Influence of Conformational Asymmetry on the Phase Behavior of Ternary Homopolymer/Block Copolymer Blends around the Bicontinuous Microemulsion Channel NING ZHOU, TIMOTHY LODGE, FRANK BATES, University of Minnesota — We have developed a new ternary polymeric system, poly(ethylene-alt-propylene) (PEP) / poly(butylene oxide) (PBO) / PEP-PBO, to study the complex phase behavior near the bicontinuous microemulsion phase channel. The molecular weights of the PEP and PBO homopolymers are 2600 and 3050 g/mol, respectively, and copolymer is 23.4 kg/mol with volume fraction composition fPBO = 0.49. A combination of small-angle neutron scattering, small-angle X-ray scattering, rheology, optical microscopy and visual oil bath measurements was employed to map out the phase diagrams at five fixed homopolymer PBO/PEP ratios, ranging from 40/60 to 60/40 by volume, with copolymer concentrations ranging from 0 to 100%. It was found that the bicontinuous microemulsion channel is consistently cut off at low temperature by a hexagonal phase. We attribute this phenomenon to the effect of the conformational asymmetry between the PEP and PBO species, whereby the more flexible PBO component induces a spontaneous curvature toward the PBO domains. These findings complement previous descriptions of the isopleth phase diagrams for the A/B/A-B systems, and identify a new design variable for preparing bicontinuous phases.

Ning Zhou
University of Minnesota

Date submitted: 23 Nov 2005 Electronic form version 1.4