Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Non-Classical Ordering of Sphere Forming SISO Tetrablock Terpolymers** JINGWEN ZHANG, University of Minnesota, SCOTT SIDES, Tech-X Research Corporation, FRANK BATES, University of Minnesota — ABAC tetrablock terpolymers represent the simplest symmetry breaking multiblock extension of ABC triblocks. The model system poly(styrene-b-isoprene-b-styrene-b-ethylene oxide) (SISO) tetrablock terpolymers were synthesized in relatively monodisperse form and the resulting morphologies were characterized by small-angle X-ray scattering, transmission electron microscopy, differential scanning calorimetry and dynamic mechanical spectroscopy. Two non-classical sphere-based orderedphases have been established in these single component materials with $P_6/mmm$ (simple hexagonal) and $P_{42}/mnm$ (tertragonal sigma phase) symmtery. A third state, tentatively associated with quasicrystalline order, has been identified at temperatures between the hexagonal and sigma phases, which occur at low temperatures, and prior to disordering, respectively. This unusual set of morphologies will be discussed in the context of segregation under the constraints associated with the tetrablock molecular architecture. Self-consistent mean-field theoretical calculations, obtained using the PolySwift++ software package, provide valuable insights into the molecular configurations associated with these morphologies.

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Date submitted: 26 Nov 2011 Electronic form version 1.4