Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Non-Classical Order in Sphere Forming ABAC Tetrablock Copolymers[1] JINGWEN ZHANG, ExxonMobil Corporation, SCOTT W. SIDES, Tech-X Research Corporation, FRANK S. BATES, University of Minnesota — AB diblock and ABC triblock copolymers have been studied thoroughly. ABAC tetrablock copolymers, representing the simplest variation from ABC triblock by breaking the molecular symmetry via inserting some of the A block in between B and C blocks, have been studied systematically in this research. The model system is poly(styrene-b-isoprene-b-styrene-b-ethylene oxide) (SISO) tetrablock terpolymers and the resulting morphologies were characterized by nuclear magnetic resonance, gel permeation chromatography, small-angle X-ray scattering, transmission electron microscopy, differential scanning calorimetry and dynamic mechanical spectroscopy. Two novel phases are first discovered in a single component block copolymers: hexagonally ordered spherical phase and tentatively identified dodecagonal quasicrystalline (QC) phase. In particular, the discovery of QC phase bridges the world of soft matters to that of metals. These unusual sets of morphologies will be discussed in the context of segregation under the constraints associated with the tetrablock molecular architecture. Theoretical calculations based on the assumption of Gaussian chain statistics provide valuable insights into the molecular configurations associated with these morphologies.

[1]the U.S. Department of Energy, Basic Energy Sciences, Division of Materials Science and Engineering, under contract number DEAC05-00OR22725 with UT-Battelle LLC at Oak Ridge National Lab.

Jingwen Zhang
ExxonMobil Corporation

Date submitted: 21 Dec 2012 Electronic form version 1.4