Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

SAXS studies of the structure of a BCC-ordered block copolymer melt subjected to uniaxial extensional flow WESLEY BURGHARDT, ERICA MCCREADY, Northwestern University — We report in situ small-angle x-ray scattering (SAXS) investigations of a spherically-ordered block copolymer melt with a low styrene content (13%) resulting in spherical polystyrene microdomains ordered in BCC lattice. Melt annealing after clearing above the ODT produces ordered samples that have a macroscopically random orientation distribution of BCC 'grains'. Melt samples are subjected to uniaxial extensional flow in a counter-rotating drum extensional flow fixture housed in an oven with synchrotron x-ray access. During flow, initially isotropic diffraction rings in SAXS patterns become deformed, reflecting distortion of the BCC lattice. Diffracted intensity also concentrates azimuthally, indicating macroscopic alignment of the BCC lattice. There is evidence that extensional flow leads to progressive disordering of the BCC structure, with loss of higher order peaks and the emergence of a diffuse 'halo' of scattering. While the primary diffraction peak is visible in directions parallel and perpendicular to the stretching direction, the deformation of the lattice d-spacing follows affine deformation. Indications of ordering persist to higher strains in samples stretched at higher extension rates, and evidence of affine lattice deformation persists to very high strains (Hencky

Wesley Burghardt
Northwestern University

Date submitted: 24 Nov 2015 Electronic form version 1.4