Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

***In-situ* synchrotron small angle and wide angle X-ray scattering (SAXS/WAXS) study of polyethylene and polyethylene/clay nanocomposites during multiaxial deformation** BILGE GURUN, DAVID BUCKNALL, YONATHAN THIO, Georgia Institute of Technology — A unique *in-situ* multiaxial deformation device (IMDD) has been designed and built specifically for simultaneous synchrotron SAXS and WAXS measurements. High-density poly(ethylene) (HDPE) /clay sheets were prepared using melt mixing and film extrusion techniques. SAXS and WAXS patterns of HDPE and HDPE/clay nanocomposites were measured in real time during *in-situ* multiaxial deformation at room temperature and at 55 $^{\circ}$C. The morphological evolution of polyethylene was affected by the existence of clay platelets as well as the temperature. Martensitic transformation of orthorhombic HDPE crystal planes into monoclinic crystal was observed under strain, which was delayed and hindered in the presence of clay nanoplatelets. The thickness of the interlamellar amorphous domain, as measured in SAXS, increased with increasing strain. The increase was slightly higher for nanocomposites compared to the pure polymer.

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Date submitted: 19 Nov 2009 Electronic form version 1.4