Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Soft Segment Orientation Effects on the Morphology RYAN WALETZKO, PAULA HAMMOND, MIT — A series of polyurethane elastomers were designed with varying poly(ethylene oxide) (PEO) lengths. Segmented polyurethanes containing higher soft segment molecular weight (4600 g/mol) demonstrated a lamellar morphology, a result of the highly crystalline hard and soft domains. Polyurethanes containing lower molecular weight PEO (1000 g/mol) showed less microphase segregation at similar hard segment contents, though shifting to a copolymer (PEO-PPO-PEO, 1900 g/mol) soft segment recovered domain segregation. High molecular weight PEO-containing polyurethanes showed a tendency to neck upon deformation, which likely resulted from the largely crystalline soft domains. Low molecular weight PEO-containing polyurethanes (1000 g/mol and 1900 g/mol) did not show a tendency to neck during deformation due to the lesser extent of microphase segregation and/or domain crystallinity. We have also investigated the effect of chemistry on morphology, thermal, and mechanical properties by varying chain extender, macrodiol, and isocyanate. Through these experiments, the goal was to determine the molecular mechanisms most responsible for mechanical property enhancement. Molecular architecture was shown to play a more prominent role in dynamic mechanical properties than hard segment percentage; amorphous polyurethane samples displayed drastic stiffness changes with strain rate.

Ryan Waletzko
MIT

Date submitted: 20 Nov 2006 Electronic form version 1.4