Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Designing 100 K Glass Transition Breadths in Bulk Polymer Systems: Effects of Architecture in Homopolymers, Copolymers, and Copolymer Blends STEPHEN MARROU, SEAN WUNDROW, JOHN TORKELSON, Northwestern University — Gradient copolymers have attracted interest as vibration or acoustic damping materials due to their extremely broad, tunable glass transition temperature (Tg) responses, up to 100 K in breadth. This behavior is caused by large compositional heterogeneity resulting from sinusoidal composition profiles in nanophase-separated systems. We have also found that some homopolymers and random copolymers exhibit large Tg breadths caused by incompatible main- and side-chain interactions. For example, the Tg response broadens with increasing side-chain length in the poly(n-alkyl methacrylate) series by more than a factor of 2 in going from poly(methyl methacrylate) to poly(n-hexyl methacrylate). We have also blended weakly-segregating styrene/n-butyl acrylate random copolymers of different compositions to allow for tunable Tg breadths over a 100 K temperature range. Finally, we have shown that blending a selective plasticizer into a styrene/4-vinylpyridine gradient copolymer results in a dramatic shift in the Tg response of a single nanophase region, increasing the Tg breadth above 100 K.

Stephen Marrou
Northwestern University

Date submitted: 10 Nov 2011 Electronic form version 1.4