Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Effect of Hydrogenation on the Glass Transition Temperatures of Novel Ring-Opened Polynorbornenes ADAM BURNS, SHENG LI, RICHARD REGISTER, Princeton University — Ring-opening metathesis polymerization (ROMP) of norbornene-type monomers has been demonstrated as a facile way to produce block copolymers incorporating semicrystalline, glassy, and rubbery blocks. Of particular interest are block copolymers, made by ROMP, with thermoplastic elastomeric properties. For this application we seek blocks with glass transition temperatures (T_g) in excess of 100 °C. To this end, novel substituted norbornene-type monomers with large, rigid substituents have been investigated. A key consequence of the ROMP mechanism is that unsaturation in the monomer is preserved in the polymer. Unsaturation in the polymer backbone is susceptible to degradation; therefore, hydrogenation is required to enhance the long-term stability of these polymers. Hydrogenation can also have a significant impact on the thermal behavior. To investigate this, we have synthesized ROMP polymers of 5-phenyl-2-norbornene and 5-cyclohexyl-2-norbornene. Hydrogenation yielded derivatives with saturated backbones. This series of polymers provides a systematic study on the influence of hydrogenation on the T_g of glassy ROMP polymers. We find that saturation of the side group increases the T_g by 14 °C, irrespective of backbone saturation. Conversely, saturation of the backbone reduces T_g by 17 °C for both aromatic and cycloaliphatic side groups. When compared to analogous studies on other ROMP polymers, it becomes clear that these trends are difficult to predict, highlighting the importance of experimental measurements.

Adam Burns
Princeton University

Date submitted: 06 Nov 2012

Electronic form version 1.4