Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Superelastic materials based on multigraft copolymers U. STAUDINGER, R. WEIDISCH, Insitute of Material Science and Technology, Friedrich-Schiller-University Jena, Germany, Y. ZHU, S. P. GIDO, Department of Polymer Science & Engineering, University of Massachusetts, Amherst, D. UHRIG, J. W. MAYS, Chemical Sciences Division and Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Tennessee, M. KLUEPPEL, German Institute of Rubber Technology (DIK), Hannover, Germany, G. HEINRICH, Leibniz Institute of Polymer Research Dresden, Germany — PI-PS-multigraft copolymers with tri- tetra- and hexafunctional PS branches have been studied to investigate the influence of molecular architecture on morphological and tensile properties and to find novel material concepts. The materials form nanostructures ranging from spheres to cylinders to lamellae. Thus these materials show excellent transparency. Mechanical properties are strongly depending on functionality of the graft copolymer and on the number of branch points per molecule. Increasing functionality and a larger number of branch points cause a distinct increase in tensile strength due to enhanced physical crosslinking in such multigrafts. Tetra- and hexafunctional multigrafts show surprising high strain at break values up to 1550 % and excellent elasticity far exceeding that of commercial elastomers. Simulation of hysteresis behavior revealed that the deformation mechanism can be explained by the flocculation model based on filled elastomers.

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Date submitted: 21 Nov 2006 Electronic form version 1.4