Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Rate-dependent Mechanical Deformation Behavior of POSS-filled and Plasticized Poly(vinyl chloride). SHARON SOONG, ROBERT COHEN, MARY BOYCE, Massachusetts Institute of Technology — In different temperatures or strain-rate regimes, the rate sensitivities of polymers change as various primary and secondary molecular mobility mechanisms are accessed. Incorporating nanoparticles into the polymer matrix can potentially alter the molecular level structure and offers an opportunity to tailor the rate-dependent mechanical deformation behavior of the polymer. In this study, methacryl-POSS (C56H88O28Si8) and dioctyl phthalate (DOP) were incorporated into poly(vinyl chloride) (PVC) through melt blending. Dynamic Mechanical Analysis revealed that the incorporation of POSS in PVC plasticizes PVC and reduces both the alpha and beta transition temperatures. As for the PVC/DOP blends, while the alpha-transition temperatures were reduced, beta-motions vanishes with high DOP contents. The rate dependent yield behavior is characterized in compression testing. Zwick Mechine is used for low to moderate strain rate (0.0001 to 0.1/s) and Split Hopkinson Bar is used for high strain rate (500 to 2000/s). It was found that PVC with POSS shows a delay in yield strength rate-sensitivity transition. For PVC with higher DOP contents which show restricted beta-motions, the rate-sensitivity transition in yield stress faded away. Constitutive model used was able to predict the rate-sensitivity transitions in the compression yield behavior of PVC compounds.

Sharon Soong
Massachusetts Institute of Technology

Date submitted: 04 Dec 2005 Electronic form version 1.4