Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Direct measurement of deformation-induced molecular mobility in polystyrene glasses BENJAMIN BENDING, HAU-NAN LEE, MARK EDIGER, University of Wisconsin - Madison — We use an optical photobleaching method to measure the molecular mobility during active deformation of lightly cross-linked polystyrene glass. We see a factor of 1000 mobility enhancement during deformation using a constant engineering stress of 16 MPa at Tg-16 K. Additionally, we observe a significant narrowing of the distribution of relaxation times in the flow regime which we interpret as increasingly homogeneous dynamics in the polystyrene glass. After accounting for the Tg shift, we obtain similar results for 2 and 4 percent cross-linking density of polystyrene. Qualitatively similar mobility results are observed during deformation of polystyrene and poly(methyl methacrylate) glasses. These results imply that the prominent beta relaxation in poly(methyl methacrylate) does not play a role in the observed deformation-induced mobility and thus changes in the alpha segmental relaxation control the non-linear mechanical response.

Benjamin Bending
University of Wisconsin - Madison

Date submitted: 19 Nov 2009 Electronic form version 1.4