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Changes in Segmental dynamics of PMMA Glass during Nonlinear Creep Deformation[1] HAU-NAN LEE, KEEWOOK PAENG, STEPHEN SWALLEN, MARK EDIGER, University of Wisconsin-Madison — Reorientation of a dye molecule can be used to monitor the segmental dynamics of polymer melt. We utilize this technique to measure the mobility of lightly cross-linked polymethylmethacrylate (PMMA) film during tensile creep deformation. We have observed deformation-induced mobility from Tg-10 K to Tg -30 K. Generally we observe the largest changes in mobility if the sample is deformed at a lower temperature. At a given temperature, mobility enhancements correlate better with strain rate than with stress or strain. The largest change in mobility is about a factor of 200 (equivalent to a temperature increase of 12 K). After removing the stress, we see that the enhanced mobility disappears slowly. These are the first direct measurements of deformation-induced polymer mobility that allow a quantitative comparison to theory and simulation.

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