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Molecular mobility measurement during constant strain rate deformation of polymer glasses BENJAMIN BENDING, KELLY CHRISTISON, M.D. EDIGER, University of Wisconsin-Madison — We use a dye reorientation method to measure the segmental mobility in poly (methyl methacrylate) during active deformation. During constant strain rate deformation at 14 K below the glass transition we observe that mobility initially increases by up to a factor of 500, as compared to the starting undeformed mobility. After the softening regime the mobility remains constant as the strain is increased. Similar qualitative trends have been seen in simulations by Riggleman et al. and in the model of Govaert et al. Comparison of these simulations and model to our experiment will be the focus of this talk. In our previous studies of poly (methyl methacrylate) and polystyrene glasses deformed with a constant stress protocol (creep), at 16 K below the glass transition of the polymers we have seen a hundred-fold enhancement of mobility. Results from all these systems can be plotted on a master plot of mobility as a function of the local strain rate during creep deformation. We have found that this correlation holds for multiple glassy polymer systems, thermal and temporal histories, and with different deformation protocols.

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