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Deformation perturbs heterogeneous dynamics and position on the energy landscape MARK EDIGER, HAU-NAN LEE[1], BENJAMIN BENDING, University of Wisconsin - Madison — Optical photobleaching experiments were used to investigate the interaction between physical aging, heterogeneous segmental mobility, and deformation in polymer glasses. Experiments were performed on lightly crosslinked poly(methyl methacrylate) glasses with systematically varying aging histories. By directly measuring the molecular mobility of polymer glasses under deformation, we observe that stresses in the pre-flow regime and flow regime are qualitatively different. In the pre-flow regime, aging and stress apparently act as two independent influences on segmental mobility; deformation causes an increase in segmental mobility but does not erase the influence of previous aging. In contrast, as a sample enters the flow regime, plastic deformation takes the glass into a high mobility state with quite homogeneous dynamics; this state is high on the energy landscape and independent of any pre-deformation aging history. Changes in dynamic heterogeneity provide information about the portions of the energy landscape visited during deformation.

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