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A microscopic view of deformation-accelerated dynamics in polymer glasses[1] MYA WARREN, JOERG ROTTLER, University of British Columbia — When amorphous polymers are deformed, the slow glassy dynamics resulting from broad distributions of relaxation times becomes accelerated and permits plastic flow. We use molecular dynamics simulations as a computational microscope to obtain insight into the origin of the deformation-accelerated dynamics and its relationship to aging in a model polymer glass. Segmental trajectories are analyzed to identify individual relaxation events, and the full distribution of relaxation times is obtained under three deformation protocols: step stress (creep), step strain, and constant strain rate deformation. As in experiments, the dynamics are accelerated by several orders of magnitude by the deformation, and a narrowing of the distribution of relaxation times during creep is directly observed. Additionally, the acceleration factor describing the transformation of the relaxation time distributions was computed and found to obey a universal dependence on the strain, independent of the age and deformation protocol.

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