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Bauschinger effect in oriented polymer glasses TING GE, MARK O. ROBBINS, Johns Hopkins University — The Bauschinger effect in oriented polymer glasses refers to the anisotropic response of the material to deformation. We use molecular simulations to examine the microscopic origin of this effect in both entangled and unentangled systems. Oriented states are obtained by stretching an isotropic state uniaxially to certain prestrains. States of different prestrains are then stretched and compressed along the axis of preorientation. As in experiment, the tensile response is stronger than the compressive one, but we find that the stresses for different prestrains collapse when plotted against the total strain with respect to the isotropic state. Examining conformations of individual chains shows that this collapse reflects a direct correlation between the degree of orientation and the stress. The stress rises with increasing chain orientation, because more local plastic rearrangements are required to maintain chain connectivity. The phenomenon is similar for entangled and unentangled chains, but entanglements force the system to deform affinely leading to a greater degree of orientation. Tensile deformations along directions at an angle θ to the preorientation are also performed. The response is less anisotropic because the initial strain has a smaller effect on the degree of orientation.

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