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Aging in the shear-transformation-zone theory of plastic deformation JOERG ROTTLER, University of British Columbia, PHILIPP MAASS, Technische Universitaet Ilmenau — Aging phenomena in the plastic response of glassy solids are studied within the theory of shear transformation zones (STZs), which describes the kinetic rearrangement of localized defects in response to external stress. To account for the slow, non-equilibrium dynamics after a quench below the glass transition temperature, two possible models are considered. In the first model, transition rates between the internal states of STZs decrease with time, while in the second model aging occurs due to the relaxation of an effective temperature that determines the number density of STZs and other out-of-equilibium degrees of freedom. We show that for reasonable choices of parameters, both models capture qualitatively typical aging features seen in computer simulations and experiments on polymer and other soft glasses: (i) Compliance curves measured for different waiting times after the quench can be superimposed when the observation times are rescaled with relaxation times, and (ii) stress-strain curves show a stationary plateau stress independent of waiting time and a peak stress that increases logarithmically with both waiting time and the strain rate.

Joerg Rottler
University of British Columbia

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