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Shearing glassy materials: insight from computer simulations

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I will discuss some aspects of flow in glassy systems that have been recently investigated using computer simulations. I will first describe some statistical properties of homogeneous flow using the "effective temperature" concept. Then I will show that complex phenomena such as yield stress, shear banding, complex stress strain curves, commonly observed in metallic glasses, amorphous polymers or complex fluids, can be observed in a very simple "computer glass" model. The existence of shear bands can be understood from the presence of a nonzero yield stress, larger than the small shear limit of homogeneous flow curves. This in turn implies that the flow curve is effectively nonmonotonic, and allows shear band formation in a restricted domain of shear rates. Finally, I will describe some results obtained in athermal systems, in which it is possible to decompose the deformation in terms of elementary plastic events.