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A Rate-Dependent Shear Transformation Zone Model of Shear Band Formation During Flow[1] ADAM R. HINKLE, MICHAEL L. FALK, Johns Hopkins University — Recent shear-experiments of carbopol gels have revealed the formation of a transient shear band before reaching the steady-state characterized by homogeneous flow. Analysis of this phenomenon using a rate-dependent effective temperature in the shear transformation zone (STZ) theory reveals that the observed fluidization proceeds via two distinct processes: A shear band initiates and broadens via disordering at the interface of the band. This is accompanied by spatially homogeneous fluidization outside of the shear band where the disorder of the gel grows uniformly. Experimental data are used to parameterize the STZ theory, and direct, quantitative comparison is made to measurements of the structural evolution of the gel.

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