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Ratio of effective temperature to pressure controls the dynamics of sheared hard spheres THOMAS HAXTON, Molecular Foundry, Lawrence Berkeley National Laboratory, ANDREA LIU, Department of Physics and Astronomy, University of Pennsylvania — Using molecular dynamics simulations, we calculate the effective temperature, T_{eff}, and the pressure, p, of steadily sheared mixtures of hard spheres of mass m and diameters σ and 1.4σ in contact with a thermal reservoir at temperature T. We vary the packing fraction, ϕ, and the shear stress, Σ. We define T_{eff} from the ratio of correlations to response and show that different correlation-response relations yield a consistent numerical value $T_{\text{eff}} \geq T$ that reduces to $T_{\text{eff}} = T$ when $\Sigma = 0$. We show that the effective temperature represents the limiting value of the effective temperature for soft spheres in the limit $p\sigma^3/\epsilon \to 0$, where ϵ is the repulsive energy scale. We find that the dimensionless ratio $T_{\text{eff}}/p\sigma^3$ controls the dynamic jamming transition that occurs with decreasing shear stress and increasing packing fraction. In particular, we find that the dependence of the dimensionless relaxation time, $\tau\sqrt{p\sigma/m}$, on $T_{\text{eff}}/p\sigma^3$ as shear stress is varied is quantitatively similar to the dependence of $\tau\sqrt{p\sigma/m}$ on $T/p\sigma^3$ in equilibrium.

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