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Bounds on the low-temperature viscosity of a fragile glass former[1]
VIKRAM JADHAO, Indiana University, MARK ROBBINS, Johns Hopkins University — One of the central debates about the nature of glass transition is whether there is a sharp phase transition where the relaxation time diverges at finite temperature or whether motion continues to gradually slow down to 0 K. Resolving this debate is challenging because of the limited range of accessible time scales. Here we use an approach based on short simulations of the nonequilibrium dynamics of a typical glass former, squalane, to calculate its equilibrium viscosity over a wide range of pressures and temperatures. The results agree with the large set of equilibrium and nonequilibrium experiments on squalane. Using this approach, we show that high-pressure, high-density simulation results set upper bounds for the rising equilibrium viscosity at ambient pressure, indicating that there is no singularity in viscosity at finite temperature. We conclude by discussing possible experimental tests of our simulation findings.

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