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Unified description of the slip phenomena in sheared polymer films: A molecular dynamics study NIKOLAI PRIEZJEV, Michigan State University — The dynamic behavior of the slip length in shear flow of polymer melts past atomically smooth surfaces is investigated using MD simulations. The polymer melt was modeled as a collection of FENE-LJ bead-spring chains. We consider shear flow conditions at low pressures and weak wall-fluid interaction energy so that fluid velocity profiles are linear throughout the channel at all shear rates examined. In agreement with earlier studies we confirm that for shear- thinning fluids the slip length passes through a local minimum at low shear rates and then increases rapidly at higher shear rates. We found that the rate dependence of the slip length depends on the lattice orientation at high shear rates. The MD results show that the ratio of slip length to viscosity follows a master curve when plotted as a function of a single variable that depends on the structure factor, contact density and temperature of the first fluid layer near the solid wall. The universal dependence of the slip length holds for a number of parameters of the interface: fluid density and structure (chain length), wall-fluid interaction energy, wall density, lattice orientation, thermal or solid walls.

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