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The Role of Extensional Viscosity in Sedimentation THEODORE A. BRZINSKI, PAULO E. ARRATIA, DOUGLAS J. DURIAN, University of Pennsylvania — When two particles in a viscous fluid approach contact the motion of the interstitial fluid is dominated by extensional flow. We demonstrate how the details of these flows influence the process of sedimentation. We are able to highlight the effects of extensional flows on particle motion by comparing granular dispersions in which the continuous phases have the same shear viscosities, but drastically different extensional viscosities. We enhance the extensional viscosity by adding a flexible, high molecular weight polymer. In the case of a system without polymer we observe settling rates in accordance with a typical Stokes' model until all grains have settled into a random close-packed arrangement. In the polymeric fluid we observe initial behavior not unlike that observed in the Newtonian case, however the dispersions exhibit a secondary prolonged sedimentation process before finally reaching the final close- packed state. The dependence of this secondary settling process on grainsize and initial packing fraction suggests that an ensemble of dispersed grains acts primarily to enhance the impact of interstitial flows on the system's dynamics.

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