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The Effect of Particle Deformation on the Collective Dynamics of Confined Rigid Spheres and Deformable Drops[1] J. BLAWZDZIEWICZ, Texas Tech University, M. LOEWENBERG, Yale University, P.J.A. JANSSEN, SABIC Innovative Plastics, M.D. BARON, Princeton University, P.D. ANDERSON, Eindhoven University of Technology, E. WAJNRYB, IPPT, Warsaw, Poland — The evolution of linear arrays of rigid spheres and deformable drops in a Poiseuille flow between parallel walls is investigated to determine the effect of particle deformation on the collective dynamics in confined particulate flows. We find that linear arrays of rigid spheres aligned in the flow direction undergo a particle-pairing instability and are unstable to lateral perturbations. Linear arrays of deformable drops, in addition to the pairing instability, exhibit other dynamical features, including formation of transient triplets, cascades of pair-switching events, and formation of pairs with equal interparticle spacing. Particle deformation also stabilizes drop arrays to lateral perturbations. These pairing and alignment phenomena are qualitatively explained in terms of hydrodynamic far-field dipole interactions (insensitive to particle deformation) and quadrupole interactions (deformation induced). We suggest that quadrupole interactions underlie the spontaneous formation of droplet strings in confined emulsions under shear [*Phys. Rev. Lett.*, 2001, **86**, 1023].

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