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Simulations of a Binary-Sized Mixture of Inelastic Grains in Rapid Shear Flow

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In an effort to explore the rapid flow behavior associated with a binary-sized mixture of grains and to assess the predictive ability of existing theory for such systems, molecular-dynamic simulations have been carried out. The system under consideration is composed of inelastic, smooth, hard disks engaged in rapid shear flow. The simulations indicate that non-dimensional stresses decrease with an increase in d_L / d_S (ratio of large particle diameter to small particle diameter) or a decrease in ν_L / ν_S (area fraction ratio), as is also predicted by the kinetic theory of Willits and Arnarson (*Phys. Fluids*, **11**, p. 3116, 1999). Furthermore, the level of quantitative agreement between the theoretical stress predictions and simulation data is good over the entire range of parameters investigated. Nonetheless, the molecular-dynamic simulations also show that the assumption of an equipartition of energy rapidly deteriorates as the coefficient of restitution is decreased. The magnitude of this energy difference is found to increase with the difference in particle sizes.