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The effect of geometry on the particle stress in suspensions of rigid particles in simple shear[1] MOHSEN DAGHOOGHI, IMAN BORAZJANI, State Univ of NY - Buffalo — The contribution of particles on the total stress of a suspension is known as particle stress, which consists of three sources: moment of stress on the particle surface, inertial term and Reynolds stress term. The symmetric part of the first term, i.e. stresslet, is considered as the most important term in rheological calculation and contribution of other terms is mainly ignored in low Reynolds regimes. For suspensions of rigid spheres at steady state these terms are negligible comparing to stresslet of the suspension, however this might not be the case for complex particle shapes. Using immersed boundary method, we simulate suspensions of complex shaped particles in simple shear flow to investigate the role of other two terms on the total particle stress and effective viscosity. We validated our results against classical analytical results for the low Reynolds-Stokes problem of suspension of ellipsoidal particles by Jeffery. We studied the effect of volume fraction of suspension and particle shape (aspect ratio) on the rheology of suspensions at Reynolds number range of $0.01 < Re < 10$. Our study shows that particle shape has an mportant role on all components of the particle stress, and for $Re > 1$ the budget of inertial term in the total particle stress is not negligible.

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