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Rheology of sheared suspensions of rough frictional particles. (English) Zbl 1416.76326
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Summary: This paper presents three-dimensional numerical simulations of non-Brownian concentrated suspensions in a Couette flow at zero Reynolds number using a fictitious domain method. Contacts between particles are modelled using a discrete element method (DEM)-like approach, which allows for a more physical description, including roughness and friction. This work emphasizes the effect of friction between particles and its role on rheological properties, especially on normal stress differences. Friction is shown to notably increase viscosity and second normal stress difference $|N_2|$ and decrease $|N_1|$, in better agreement with experiments. The hydrodynamic and contact contributions to the overall particle stress are particularly investigated. This shows that the effect of friction is mostly due to the additional contact stress since the hydrodynamic stress remains unaffected by friction. Simulation results are also compared with experiments, such as normal stresses or effective friction coefficient $\mu(I_\nu)$, and the agreement is improved when friction is accounted for. This suggests that friction is operative in actual suspensions.

MSC:

76T20 Suspensions

Cited in **12** Documents

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