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Normal stress differences in a sheared gas-solid suspension SAIKAT SAHA, MEHEBOOB ALAM, Jawaharlal Nehru Centre, Jakkur PO, Bangalore 560064 — The stress tensor and normal stress differences are analyzed for a homogeneously sheared gas-solid suspension using Enskog-Boltzmann equation. Inelastic particles are suspended in a viscous fluid of viscosity μ_f and experience a Stokes drag force. Viscous heating due to shear is compensated by (i) the inelastic collisions between particles and (ii) the drag force experienced by the particles due to the interstitial fluid. Rheology of the particle phase is analyzed with anisotropic-Gaussian as the single particle distribution function. The first ($\mathcal{N}_1$) and second ($\mathcal{N}_2$) normal stress differences are computed as functions of the density (ν), Stokes number (St) and restitution coefficient (e). A comparison with the existing simulation data shows an excellent agreement for both $\mathcal{N}_1$ and $\mathcal{N}_2$ over the predictions from other Grad-level theories. Finally, in the limit of $St \to \infty$ ($\mu_f \to 0$), the related results from the conventional theory of dry granular flows are recovered.

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