

Abstract Submitted
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Shallow gravity driven particle-laden flows - Role of normal stresses ANUBHAB ROY, DARISH JESWIN DHAS S, Indian Institute of Technology Madras — We study the stability of particle-laden falling films with the inclusion shear-induced migration and particle normal stresses.. In absence of particles, Yih (1963) in his pioneering study carried out a linear stability analysis and identified a long wavelength instability in a falling film. The presence of particles alters the rheology of the system with the alteration of local shear stress and also through an additional particle normal stress thus coupling with the momentum balance. This is done by using a form of particle stress that is inclusive of both the isotropic thermal stress and the stress due to shear induced migration (Frank et al. 2003). The shear induced stresses are described by constitutive models based on the suspension balance model (Nott & Brady 1994, Morris & Boulay 1999). The momentum balance and the particle evolution equations are linearised to arrive at a generalized Orr-Sommerfeld system using which the stability of the system is studied, both numerically and asymptotically in the long wavelength limit. Subsequently, the role of in-homogeneous particle concentration and anisotropic particle stresses on the interfacial stability is explored.

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