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Shear Rheology of a Suspension of Deformable Solids in Viscoelastic Fluid via Immersed Boundary Techniques[1] CHRISTOPHER GUIDO, ERIC SHAQFEH, Stanford University — The simulation of fluids with suspended deformable solids is important to the design of microfluidic devices with soft particles and the examination of blood flow in complex channels. The fluids in these applications are often viscoelastic, motivating the development of a high-fidelity simulation tool with general constitutive model implementations for both the viscoelastic fluid and deformable solid. The Immersed Finite Element Method (IFEM) presented by Zhang et al. (2007) allows for distinct fluid and solid grids to be utilized reducing the need for costly re-meshing when particles translate. We discuss a modified version of the IFEM that allows for the simulation of deformable particles in viscoelastic flows. This simulation tool is validated for simple Newtonian shear flows with elastic particles that obey a Neo-Hookean Law. The tool is used to further explore the rheology of a dilute suspension of Neo-Hookean particles in a Giesekus fluid. The results show that dilute suspensions of soft particles have viscosities that decrease as the Capillary number becomes higher in both the case of a Newtonian and viscoelastic fluid. A discussion of multiple particle results will be included.

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Christopher Guido
Stanford University

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