

Constant Force and Constant Velocity Momentum Tracers in Concentrated Suspensions

Patrick T. Reardon⁽¹⁾, **Alan L. Graham**⁽¹⁾, James R. Abbott⁽²⁾, Howard Brenner⁽³⁾

(1) *Los Alamos National Laboratory, Los Alamos, USA*

(2) *Texas Tech University, Lubbock, USA*

(3) *Massachusetts Institute of Technology, Cambridge, USA*

Here we report on the results of experiments designed to compare constant force and constant velocity experiments for test spheres translating through suspensions of non-colloidal, neutrally-buoyant spheres dispersed in viscous Newtonian fluids. Measurements were made of the apparent viscosity of a suspension using either a settling ball or momentum tracer animated by a constant gravitational force or a towed ball translating with a constant velocity. In all of the suspensions, the apparent viscosity in the constant velocity experiments was found to be significantly larger than that in the constant force experiment. This ratio increases linearly as the solid fraction increases. In all of the dilute suspensions, and in concentrated suspensions with very narrow size distributions, both viscosities were found to be independent of the size and the velocity of the test sphere. In concentrated suspensions with broad particle distributions, both apparent viscosities are found to be shear thinning.

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