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Shear Stress Measurements of Non-Spherical Particles in High Shear Rate Flows ERIN KOOS, MELANY L. HUNT, CHRISTOPHER E. BRENNEN, California Institute of Technology — The behavior of liquid-solid flows varies greatly depending on fluid viscosity, particle and liquid inertia, and collisions and near-collisions between particles. An initial investigation by Bagnold found two different flow regimes [1]. In an examination of that work, Hunt *et al.* found that Bagnold's experiments were marred by secondary flows in the fluid [2]. The current experiment addresses this rheology further. Shear stress measurements used a coaxial rheometer with a height to gap ratio (h/b) of 11.7 and gap to outer radius ratio (b/r_o) of 0.166 that was specially designed to minimize effects of secondary flows. Experiments were performed for a range of Reynolds numbers, solid fractions and ratio of particle to fluid densities. With neutrally buoyant particles, the dimensional shear stress exhibits a linear dependence on Reynolds Number: the slope is monotonic but a non-linear function of the solid fraction. Though non-neutrally buoyant particles exhibit a similar linear dependence at higher Reynolds numbers, at lower values the shear stress exhibits a non-linear behavior in which the stress increases with decreasing Reynolds number due to particle settling.
[1] R.A. Bagnold, *Proc. R. Soc. Lond. Ser. A,* **225**, p.49 (1954).
[2] M.L. Hunt etc., *J. Fluid Mech.,* **452**, p.1 (2002).

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