Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Bi-disperse particle-laden flows in the Stokes regime GILBERTO URDANETA, UCLA, SARO MEGUERDIJIAN, USC, KALI ALLISON, Harvey Mudd, THOMAS CRAWFORD, University of Cambridge, WYLIE ROSENTHAL, Harvey Mudd, SUNGYON LEE, ALIKI MAVROMOUSTAKI, ANDREA BERTOZZI, UCLA — We present an experimental study which investigates the motion of bi-disperse suspensions consisting of ceramic (heavy) and glass (light) beads in PDMS oil flowing down an inclined plane under the action of gravity. Both types of beads are denser than the oil. We perform a parametric study in which we vary the inclination angle of the plane, the total particle volume fraction and the relative ratio of glass to ceramic beads. Mono-disperse suspensions of negatively buoyant particles give rise to three regimes: a "settled" regime in which particles settle to the substrate, a "ridged" regime in which particles settle to the front, and a transient, "well-mixed" regime in which settling does not occur. A similar trend is observed in the current study; lower inclination angles and higher concentrations of the ceramic beads favor the settled regime. Further, the addition of a second particle species induces a striking effect in which the heavier ceramic beads migrate on top of the lighter beads; this phenomenon is thought to be the result of competing forces in the direction normal to the flow arising from gravitational settling and shear-induced migration. We discuss the effect of experimental parameters on the location of the front versus time and changes in the fingering instability.

Aliki Mavromoustaki
UCLA

Date submitted: 08 Aug 2012 Electronic form version 1.4