

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

The effect of interfacial slip on the rheology of a dilute emulsion of drops for small capillary numbers ARUN RAMCHANDRAN, University of Toronto, L. GARY LEAL, University of California at Santa Barbara — We present the constitutive equation for the volume-averaged hydrodynamic stress for a dilute emulsion in a linear ambient flow, when there is slip at the liquid-liquid interface between the Newtonian drop and suspending fluids. Slip is modeled using the Navier slip boundary condition. We provide analytical solutions in the limit of small capillary numbers for the shape deformation, viscosity and normal stresses. Slip moderates these quantities, with changes from the no slip case being more pronounced for large drop viscosities relative to the suspending fluid. It has been suggested in the past that slip can explain the anomalously low viscosities of certain polymeric blends. Our analysis indicates that slip can only partially account for these deviations, and that other mechanisms should be explored to explain this discrepancy.

Arun Ramchandran
University of Toronto

Date submitted: 16 Jul 2012

Electronic form version 1.4