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Influence of shape and boundary condition on the drag on bubbles moving in non Newtonian liquids E. SOTO, C. GOUJON, R. ZENIT, Inst. Inv. Materiales, Universidad Nacional Autonoma de Mexico — Bubbles moving in non Newtonian fluid exhibit a peculiar behavior: the terminal velocity increases abruptly for a critical value of the volume. There has been a long debate on the nature of this phenomenon, one of which assumes that the boundary condition on the surface of the bubble changes from non-slip to slip. To investigate this claim we have performed an axi-symmetric 2D simulation to determine the drag on a bubble moving in a container. The parameters used are those corresponding to bubbles in which the bubble velocity discontinuity appears. From experiments, the exact shape of bubbles is obtained by a digital analysis. The profile is then feed into a fixed shape Navier-Stokes solver. The viscosity and rise velocity are also taken from the experiments. Then the boundary condition on the surface is chosen to either be slip or non-slip. The drag coefficient can be calculated for each case. We tested cases corresponding to bubbles in non-Newtonian liquids right before and after the velocity discontinuity. Bubbles below this critical volume are spheroidal considering a rigid interface. Bubbles above this value have a tear like shape, with or without a tail, and a free interface. Our results show that the drag reduction associated with the bubble velocity discontinuity is not as large as that observed experimentally. Hence, the change of shape and boundary conditions cannot fully explain the nature of this phenomenon.

Roberto Zenit
IIM- UNAM

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