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Hydrodynamic interaction of a bubble pair ascending in-line in a viscoelastic liquid

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When the liquid in a bubbly flow is non Newtonian, a strong tendency to form large clusters and aggregates has been observed. In order to understand the mechanisms that lead to clustering in these liquids, we conduct experiments to determine the hydrodynamic interactions for a pair of bubbles rising in-line in a quiescent liquid. We fabricate viscoelastic fluids with shear-dependent viscosity with water-glycerin mixtures and polyacrylamide. Bubble pairs of different sizes are produced with capillaries of different inner diameters; the control of the bubble formation is achieved using a pulsatile syringe pump and a set of rapid-closing valves. The motion of bubbles is visualized with a high-speed camera. The results are contrasted with those from a Newtonian reference fluid. We observe that the interaction is significantly different from the so-called drafting-kissing-tumbling process that occurs for bubble pairs Newtonian liquids. In general, for viscoelastic fluids we observe no-kissing (how sad). Also, the bubbles do not drift apart indefinitely after interacting; instead, the bubble-pair continues to rise at a constant separation distance and angle. Furthermore, the interaction process appears to me mediated by the appearance, or not, of the negative wake behind the bubbles. Preliminary results will be shown and discussed.