Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Hydrodynamic interaction of two capsules in simple shear flow ETIENNE LAC, U.C. Santa Barbara, DOMINIQUE BARTHES-BIESEL, Université de Technologie de Compiègne, France, DEPT. OF MECHANICAL AND ENVIRONMENTAL ENG. TEAM, UMR CNRS 6600 COLLABORATION — We present a numerical model of the hydrodynamic interactions between two capsules freely suspended in a simple shear flow (SSF). The capsules are identical and consist of a liquid droplet enclosed by a thin hyper-elastic membrane. Such particles can be used in applications where encapsulation of living cells or of active agents in a protecting membrane is necessary. We assume a Stokes flow and use a boundary integral method to represent the fluid motion of the internal and suspending liquids. An isolated capsule subjected to SSF will interact with the two liquids until equilibrium is reached between the in-plane elastic stress and the viscous traction exerted on the membrane. The membrane may undergo very large deformations, thus making the problem non-linear. Monitoring the stress level in the membrane is important to predict burst. When two capsules interact in SSF, they eventually overlap and pass each other. During that process, the membranes are submitted to extra strain/stress which may lead to unexpected break-up. Pairwise interactions also cause an irreversible cross-flow trajectory shift, showing the self-diffusivity of the capsules. The comparison with a pair of droplets shows that the membranes have a strong effect on short range interactions.

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Date submitted: 16 Sep 2005 Electronic form version 1.4