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Interactions between two unilamellar vesicles L. GARY LEAL, JOHANN WALTER, Department of Chemical Engineering, University of California, Santa Barbara — Suspensions of lipid vesicles are widely used in industrial applications such as personal and household care products. Interactions between vesicles can cause them to adhere and aggregate, which may dramatically modify the rheology of the suspension. In this work, we study the interactions of two unilamellar vesicles in a head-on collision. The study takes into account hydrodynamic phenomena, electrostatic repulsion between charged vesicles, depletion attraction forces due to polymers in solution and the effect of the deformation of the vesicles. Numerical simulations are conducted using an axisymmetric model coupling boundary integrals for the motion of the fluids and finite elements for the membrane mechanics. The results are compared with a new analytical scaling theory. Contrary to drops, it is shown that the drainage time is reduced when the driving force bringing the vesicles together increases. This is due to the increasing tension in the membrane as the vesicles get closer, which leads to a higher pressure in the film. It is also shown that the vesicles' ability to deform can significantly enhance the adhesion between them.

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