The Effect of Slight Deformation on Binary Interactions of Sedimenting Drops with Partially Mobile Interfaces MICHAEL ROTHER, University of Minnesota Duluth — Collision efficiencies are determined for two slightly deformable drops in gravitational motion with van der Waals forces and negligible inertia, using methodology borrowed from matched asymptotic expansions. The drop interfaces are free of surfactant and partially mobile, so that the drop-to-medium viscosity ratio is $O(10)$. The outer solution for two sedimenting, spherical drops in the absence of van der Waals forces is used to find the driving force for the inner region. In the inner region, where deformation is confined to the area of close approach, the appropriate thin-film equations for partially mobile interfaces, including attractive molecular forces, are used to find the evolution of the gap between the drops. Solution of this system of integro-differential equations coupling the flow inside the drops and that within the small gap allows demarcation of trajectories leading to drop coalescence and separation. Full boundary-integral simulations have verified the accuracy of this quasi-asymptotic approach in the case of drops with partially mobile interfaces. This technique may also prove suitable for contaminated drops in some limiting cases, such as incompressible surfactant.

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