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Pairwise Hydrodynamic Interaction of Particles Straddling Flat and Curved Fluid Interfaces SUBHABRATA DAS, PhD Candidate, Langmuir Center of Colloids and Interfaces, Columbia University, JOEL KOPLIK, Physics Department, City University of New York, RAYMOND FARINATO, Senior Research Fellow, Solvay Specialty Chemicals, D.R. NAGARAJ, Principal Research Fellow, Solvay Specialty Chemicals, CHARLES MALDARELLI, Professor, Chemical Engineering, City University of New York, PONISSERIL SOMASUNDARAN, Professor and Director, Langmuir Center of Colloids and Interfaces, Columbia University —
Numerical solutions are obtained for the hydrodynamic interaction, in the creeping flow regime, for two identical particles floating at an air/liquid interface as a function of the inter-particle separation distance and their immersion depth into the liquid phase. Drag coefficients are computed for all modes (components of the resistance matrix) for translational motion along and perpendicular to the inter-particle line of centers for particles confined to the interface. The largest interaction when the particles mutually approach one another. For a flat free interface, the interaction of mutual approach for hydrophilic particles was found to be larger than that in the bulk, while reverse effect was observed for hydrophobic particles. The coefficients are used to compute the trajectories for the mutual approach of particle pairs subject to attractive capillary forces. We then imposed a curvature to the interface and re-calculate the drag coefficients as a function of the immersion depth, separation distance and quotient of the particle size to interface radius of curvature.

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