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Growth and Interaction of Colloid Nuclei[1] MICHAEL-ANGELO LAM, BORIS KHUSID, New Jersey Institute of Technology, WILLIAM MEYER, NASA Glenn Research Center, LOU KONDIC, New Jersey Institute of Technology — We study evolution of colloid systems under zero-gravity conditions. In particular, we focus on the regime where there is a coexistence between a liquid and a solid state. Under zero gravity, the dominating process in the bulk of the fluid phase and the solid phase is diffusion. At the moving solid/liquid interface, osmotic pressure is balanced by surface tension, as well as balancing fluxes (conservation of mass) with the kinematics of nuclei growth (Wilson-Frenkel law). Due to the highly nonlinear boundary condition at the moving boundary, care has to be taken when performing numerical simulations. In this work, we present a nonlinear model for colloid nuclei growth. Numerical simulations using a finite volume method are compared with asymptotic analysis of the governing equation and experimental results for nuclei growth. Novel component in our numerical simulations is the inclusion of nonlinear (collective) diffusion terms that depend on the chemical potentials of the colloid in the solid and fluid phase. The results include growth and dissolution of a single colloidal nucleus, as well as evolution of multiple interacting nuclei.

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