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Freezing and Melting of Colloidal Crystals with Short-Range Attractive Potential J.R. SAVAGE, D.W. BLAIR, R.A. GUYER, A.D. DINSMORE — We study the kinetics of melting and freezing of colloidal crystals formed by a short-range attractive potential. We use aqueous suspensions of micron-sized latex spheres mixed with surfactant micelles, which create a depletion attraction among the spheres. Single- and multi-layer crystals appear on the glass surface. Upon uniformly heating or cooling, the micelles grow or shrink. Upon heating, the depletion attraction weakens by up to 0.7 kT, and the crystals melt. Optical microscopy is used to track the motions of hundreds of colloidal spheres for up to 8 hours, until crystals have melted. We initially observe a steady decrease in the size of the crystallites. When the size reaches approximately 20-30, however, crystallites rapidly shrink. Once the crystals have melted, we then supercool them and monitor the nucleation and growth of crystallites. The kinetics of individual bond-breaking events and the evolution of the crystalline order parameter in both melting and freezing will be presented. This work is supported by the NSF-DMR 0305395.

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