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Experimental Measurement of Freezing Kinetics in Two-Dimensional Colloidal Crystals J.R. SAVAGE, A.D. DINSMORE, Umass, Amherst — We study the freezing kinetics of two-dimensional 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. The depletion attraction between the spheres and the coverslip enables us to create a two-dimensional system. Upon uniformly heating or cooling the sample, the micelles grow or shrink and the depletion attraction changes in magnitude. Optical microscopy is used to track the motions of thousands of colloidal spheres in the process of freezing or melting . By varying the density (area fractions of 17-34%) and the amount of supercooling, we can measure the dynamics of nucleation and growth of crystallites. A two-stage nucleation process can be seen in samples with density of 30% in which a meta-stable liquid droplet is first formed; then the crystallite is nucleated from within. At higher and lower densities the crystals nucleate in the typical fashion with large 6-fold orientational symmetry at small cluster size. We will present results on the evolution of the orientational order of crystallites and their degree of crystallinity as a function of both time and cluster size. We will also compare and contrast these density dependent freezing results to earlier work done on the melting process. This work is supported by the NSF-DMR 0605839.

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