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Characterizing the dynamics of phase transitions of DNA-grafted colloidal particles ALEXANDER HENSLEY, W. BENJAMIN ROGERS, Martin A. Fisher School of Physics, Brandeis University — Grafting DNA onto colloidal particles can 'program' them with information that tells them exactly how to self-assemble. Advances in our understanding of these specific interactions have enabled the assembly of many crystal phases and could be extended to the assembly of prescribed structures. However, structure is just one piece of the puzzle; self-assembly describes a phase transition between a disordered state and an ordered state, or a pathway on a phase diagram. In this talk I present an experimental study of the dynamics of these phase transitions in suspensions of polystyrene particles grafted with single-stranded DNA. Hybridization of complementary DNA grafted to particles, as well as binding of free DNA strands in solution, drives colloids to aggregate in a tunable manner. By varying the concentration of free strands in solution, colloid volume fraction, and interaction strength, we explore the roles of the pair interaction and binding kinetics on the dynamics of assembly. Using differential dynamic microscopy we extract the changing hydrodynamic size of clusters of colloids as the system evolves with time. These experiments could provide useful insights into dynamics of phase transitions, such as the presence and heights of barriers to assembly.

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