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A field-directed colloidal phase transition ERIC FURST, University of Delaware, JAMES SWAN, Massachusetts Institute of Technology, JONATHAN BAUER, University of Delaware — Suspensions of polarizable colloids are expected to form crystalline equilibrium phases when exposed to a steady, uniform field. However, when colloids become localized this field-induced phase transition arrests and the suspension persists indefinitely as a kinetically trapped, percolated structure. We show that by toggling the applied field on and off gels formed in MR fluids can be annealed. There is a stark boundary as a function of magnetic field strength and toggle frequency that distinguishes arrested states from phase separation. A key advantage of self-assembly in toggled fields is the relatively large range of field-strengths (effective temperatures) that lead to phase separation. Finally, we demonstrate that such directed self-assembly can be used to create colloidal crystals of uniform size. These results demonstrate how kinetic barriers to a colloidal phase transition are subverted through measured, periodic variation of driving forces.

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