

Abstract Submitted
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Electric field driven mesoscale phase transition in polarized colloids.¹ BORIS KHUSID, EZINWA ELELE, QIAN LEI, New Jersey Inst of Technology — A mesoscale phase transition in a polarized suspension was reported by Kumar, Khusid, Acrivos, PRL95, 2005 and Agarwal, Yethiraj, PRL102, 2009. Following the application of a strong AC field, particles aggregated head-to-tail into chains that bridged the interelectrode gap and then formed a cellular pattern, in which large particle-free domains were enclosed by particle-rich thin walls. Cellular structures were not observed in numerous simulations of field induced phase transitions in a polarized suspension. A requirement for matching the particle and fluid densities to avoid particle settling limits terrestrial experiments to negatively polarized particles. We present data on the phase diagram and kinetics of the phase transition in a neutrally buoyant, negatively polarized suspension subjected to a combination of AC and DC. Surprisingly, a weak DC component drastically speeds up the formation of a cellular pattern but does not affect its key characteristic. However, the application of a strong DC field destroys the cellular pattern, but it restores as the DC field strength is reduced. We also discuss the design of experiments to study phase transitions in a suspension of positively polarized, non-buoyancy-matched particles in the International Space Station.

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