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Structure and dynamics of self-assembling colloidal monolayers in oscillating magnetic fields ALISON KOSER, PAULO ARRATIA, University of Pennsylvania — Many fascinating phenomena such as large-scale collective flows, enhanced fluid mixing and pattern formation have been observed in so-called active fluids, which are composed of particles that can absorb energy and dissipate it into the fluid medium. For active particles immersed in liquids, fluid-mediated viscous stresses can play an important role on the emergence of collective behavior. Here, we experimentally investigate their role in the dynamics of self-assembling magnetically-driven colloidal particles which can form highly organized hexagonal lattices that span length scales much larger than a particle diameter. We find that viscous stresses reduce hexagonal ordering, generate smaller clusters, and significantly decrease down the rate of cluster formation, all while holding the system at constant number density. Furthermore, we show that time and length scales of cluster formation depend on and scale with the Mason number (Mn) or ratio of viscous to magnetic forces. Our results suggest that viscous stresses hinder collective behavior in a self-assembling colloidal system. This work is supported by the Army Research Office through the award W911NF-11-1-0488.

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