Abstract Submitted
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Crystalline aggregates of magnetic colloidal particles[1] JOSHUA E.S. SOCOLAR, CATHERINE C. MARCOUX, Physics Department, Duke University, Durham, NC, LIN FU, PATRICK CHARBONNEAU, Duke Chemistry, YE YANG, BENJAMIN B. YELLEN, Duke Mechanical Engineering and Materials Science — A colloidal system of magnetic and non-magnetic spheres confined to a 2D monolayer has been found to form a variety of structures, including Kagome, honeycomb, and square lattices, as well as various chain and ring configurations [1]. In these experiments, the layer of beads is immersed in a ferrofluid and placed in an external magnetic field and the different structures are obtained for different values of the relative concentrations of the bead types, the susceptibility of the ferrofluid, and the angle of the field with respect to the assembly plane. We study an approximate model for the potential energy of the system based on self-consistent solutions for the magnetic moments of point dipoles. We find that the model accounts well for the stability of the observed phases and we identify additional possible phases via a genetic algorithm that searches for crystal structures with up to ten atoms per unit cell. Further calculations suggest the possibility of creating materials with strong elastic responses to applied magnetic fields.

[1] K. S. Khalil, A. Sagastegui, Y. Li, M. A. Tahir, J. E. S. Socolar, B. J. Wiley, and B. B. Yellen, *Nat. Comm.*, **3**, Article number: 794 (2012).

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