Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Self-assembly mechanism for limit-periodic structure[1] CATHERINE MARCOUX, JOSHUA SOCOLAR, Duke University — Limit-periodic (LP) structures, which are the union of an infinite set of periodic lattices with ever increasing lattice constants, present a challenge for self-assembly protocols. We consider the possibility of forming a LP phase in a slow quench of a collection of colloidal particles designed to mimic the Taylor-Socolar monotile system.[2] A toy model with discrete tile orientations and mismatch energies yields the LP state through an infinite sequence of phase transitions.[3] Here we present the results of Monte Carlo simulations of slow quenches of identical hard disks with embedded magnetic dipoles, allowing for continuous rotations of the close-packed disks. Surprisingly, an extremely slow quench still results in the spontaneous emergence of the LP state even when the system has a periodic ground state. The series of phase transitions preempts the formation of the periodic phase, leading to low energy states separated from the ground state by insurmountable free energy barriers.

[1]Supported by the NSF Research Triangle MRSEC (DMR-1121107)
[2]J. E. S. Socolar and J. M. Taylor, *J. Comb. Theory A* **118**: 2207 (2011).
[3]C. Marcoux, T. W. Byington, Z. Qian, P. Charbonneau, and J. E. S. Socolar, *Phys. Rev. E* **90**, 012136 (2014).

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Date submitted: 11 Nov 2014 Electronic form version 1.4