Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Experiments with 2D quasistatic and shaken arrays of permanent magnet N-mers ($N \geq 1$)[1] PETER KOCH[2], SUNY Stony Brook, MARK SHATTUCK, Levich Inst., CCNY — We extend methods used to study macroscopic grains (contact forces) to 2D (x, y) arrays of N-mers of cylindrical (L=D=3.18 mm) Nd-Fe-B magnets in a rectangular cell with glass plates Δz ~3.3 mm apart and parallel to magnet faces. Aligned monomers repel with a measured d^{-4} (dipole-dipole) force dependence, with d the separation between cylinder axes. With fixed, aligned monomers separated by 6.35 mm along the cell walls, hundreds of aligned monomers can move in the cell subject to magnet-glass friction and gravity (either $\parallel$ or $\perp$ to z) but without contacting each other or the walls. Quasistatically moving one wall to decrease volume V increases pressure P on the magnetic particles and leads to ordering observed with annealing. Driving the array, e.g., by shaking one wall, can produce disorder; we study how this varies with driving strength at fixed V or P. Replacing all non-wall monomers with similarly aligned tetramers (3 magnets magnetically bound to an inverted magnet) allows for more ordered states in quasistatic experiments; macroscopic, internal degrees of freedom into which energy can flow in driven experiments; and rearrangements ("chemical reactions") for strong driving.

[1]Supported by NSF DMR-0934206
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Date submitted: 20 Nov 2009 Electronic form version 1.4