Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Janus Magnetic Rods, Ribbons, and Rings JING YAN, KUNDAN CHAUDHARY, SUNG CHUL BAE, JENNIFER LEWIS, STEVE GRANICK, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign — Dipolar particles are fundamental building blocks in nature and technology but the roles of anisotropy are seldom explored in their assembly. Here, we fabricate colloidal silica rods coated on one hemicylinder with a thin magnetic layer to satisfy multiple criteria: nearly monodisperse, easily imaged, and magnetic interaction dominant over gravity. We confirm long-predicted features of dipolar assembly and stress the microstructural variety brought about by shape and chemical anisotropy, especially by borrowing knowledge learned from molecules. We describe analogies to liquid crystalline deformations with bend, splay and twist; an analogy to cis/trans isomerism in organic molecules, which in this system can be controllably and reversibly switched; and a field-switching methodology to direct single ribbons into not only single but also multiple rings that can subsequently undergo hierarchical self-assembly. Going beyond earlier investigations of phase behavior, we show that dynamic reconfigurability presents subtle materials issues and possibilities.

Jing Yan
Department of Materials Science and Engineering,
University of Illinois at Urbana-Champaign

Date submitted: 23 Oct 2012 Electronic form version 1.4