Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Controlling Chirality of Entropic Crystals[1] PABLO DAMASCENO, Applied Physics Program, University of Michigan, ANDREW KARAS, Chemical Engineering Department, University of Michigan, BENJAMIN SCHULTZ, Physics Department, University of Michigan, MICHAEL ENGEL, SHARON GLOTZER, Chemical Engineering Department, University of Michigan — Colloidal crystal structures with complexity and diversity rivaling atomic and molecular crystals have been predicted and obtained for hard particles by entropy maximization. However, thus far homochiral colloidal crystals, which are candidates for photonic metamaterials, are absent. Using Monte Carlo simulations we show that chiral polyhedra exhibiting weak directional entropic forces self-assemble either an achiral crystal or a chiral crystal with limited control over the crystal handedness. Building blocks with stronger faceting exhibit higher selectivity and assemble a chiral crystal with handedness uniquely determined by the particle chirality. Tuning the strength of directional entropic forces by means of particle rounding or the use of depletants allows for reconfiguration between achiral and homochiral crystals. We rationalize our findings by quantifying the chirality strength of each particle, both from particle geometry and potential of mean force and torque diagrams.

[1]Work supported by the National Science Foundation, Division of Materials Research Award No. DMR 1120923, U.S. Army Research Office under Grant Award No. W911NF-10-1-0518, and also by the DOD/ASD (RE) under Award No. N00244-09-1-0062

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Date submitted: 06 Nov 2015 Electronic form version 1.4