MAR08-2007-006657

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Artificial Kagome Spin Ice[1]

JOHN CUMINGS, Department of Materials Science and Engineering, University of Maryland

Recently, significant interest has emerged in fabricated systems that mimic the behavior of geometrically-frustrated materials. Here, I will present the full realization of such an artificial spin ice system on a two-dimensional kagome lattice, and I will present results obtained by directly counting individual pseudospins, demonstrating rigid adherence to the local ice rule. This adherence is maintained even when the lattice is randomized through a rigorous demagnetization process. The resulting spin configurations show not only local ice rules and long-range disorder, but also correlations consistent with spin ice Monte Carlo calculations. Deviations in the correlation values suggest that dipolar corrections are significant in this system, as in pyrochlore spin ice. Because the pseudospins can be observed directly, the system also presents new routes for determining the entropy of such frustrated systems by direct observation, without heat-capacity background subtraction. I will also present the unique behavior of the system during magnetic reversal cycles, showing avalanche-like phenomena. Because of the simplicity of the structure and the robustness of its behavior, it serves as an ideal system for studying frustration in general, including the possible influences of controllable lattice imperfections.

[1]This work is supported by the NSF-MRSEC at the University of Maryland, DMR0520471 and by NSF-DMR075368