Micrometer sized colloidal microgel spheres are self-assembled into a buckled triangular lattice with either up or down displacements analogous to an antiferromagnetic Ising model on a triangular lattice. This simple tunable soft-matter system provides the first direction visualization of single spin dynamics, thermal excitations, and defects in a geometrical frustrated system.

In-plane lattice distortions partially relieve frustration and produce ground-states with zigzagging stripes and subextensive entropy.

Spatial spin correlations

In-plane lattice distortions partially relieve frustration and produce ground-states with zigzagging stripes and subextensive entropy.

Spin autocorrelations: stretched exponential $C(t) \sim e^{-t/\tau}$

⇒ Glassy dynamics

Frustration?

antiferromagnetic Ising spins

1.5-layer micro-spheres in water at equilibrium

diameter tunable:

Spatial spin correlations

$N_x=0$ $N_x=1$ $N_x=2b$ $N_x=2c$ $N_x=3c$

24.7°C

27.1°C

In-plane lattice distortions partially relieve frustration and produce ground-states with zigzagging stripes and subextensive entropy

$N_x=0$ $N_x=1$ $N_x=2b$ $N_x=2c$ $N_x=3c$

24.7°C

25.3°C

Press:
ScienceDaily: http://www.sciencedaily.com/releases/2008/12/081217190340.htm