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Doped Artificial Spin Ice CYNTHIA OLSON REICHHARDT, Theoretical Division, Los Alamos National Laboratory, ANDRAS LIBAL, Faculty of Mathematics and Computer Science, Babes-Bolyai University, CHARLES REICHHARDT, Theoretical Division, Los Alamos National Laboratory — We examine square and kagome artificial spin ice for colloids confined in arrays of double-well traps. Unlike magnetic artificial spin ices, colloidal and vortex artificial spin ice realizations allow creation of doping sites through double occupation of individual traps. We find that doping square and kagome ice geometries produces opposite effects. For square ice, doping creates local excitations in the ground state configuration that produce a local melting effect as the temperature is raised. In contrast, the kagome ice ground state can absorb the doping charge without generating non-ground-state excitations, while at elevated temperatures the hopping of individual colloids is suppressed near the doping sites. These results indicate that in the square ice, doping adds degeneracy to the ordered ground state and creates local weak spots, while in the kagome ice, which has a highly degenerate ground state, doping locally decreases the degeneracy and creates local hard regions.

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