Abstract Submitted
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Two 2D models of color ice as conceptual generalizations of spin ice CHIA-REN HU, Texas A&M University — Spin ice is a novel condensed-matter system with magnetic-monopole-like elementary excitations. It is also the first example of fractionalization – a spin (i.e., a magnetic dipole) is split into two oppositely signed magnetic monopoles – in three dimensions. It is realized with Ising spins on a pyrochlore lattice, i.e., corner-sharing tetrahedra, obeying the ice rule – two in and two out – with respect to each tetrahedron, forming the highly-degenerate ground states. Here we propose two two-dimensional models of "color ice", with color (red-green-blue) "tripoles" located on the vertices of (i) corner sharing triangles, and (ii) edge sharing hexagons, obeying generalized ice rules to keep each triangle or hexagon color neutral in the highly degenerate ground states. Excitations in this system are color charges (monopoles), fractionalizing a color tripole, created in color neutral combinations. So far, these color charges can only move in 1D. Their interactions are 2D-Coulomb like, and Abelian. A color tripole in these models can be shown to be equivalent to two 2D Coulomb dipoles of different kinds in mutually perpendicular orientations. Extension to 3D is still being attempted.

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