

Competing spin interactions as a new route to multiferroic materials

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Strongly-correlated quantum spin systems with competing interactions can have a large number of degenerate ground state configurations with unusual spin fluctuations. Anisotropic interactions can then favor a subset of spin states and new ground states can emerge. I will present three materials whose field-temperature phase diagrams result from competing spin interactions. Some of the magnetic phases develop ferroelectric order which is directly coupled with the magnetic order parameters. The materials were characterized using macroscopic measurements and neutron diffraction/spectroscopy. We find that in all three materials, ferroelectricity emerges as soon as the magnetic structure breaks the inversion symmetry of the crystal.