Controlling the stripe order in a diluted frustrated magnet

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Significant attention has recently been attracted by phases that spontaneously break real-space symmetries in addition to spin, phase, or gauge symmetries. These phases include the charge-density wave or stripe phases in the cuprate superconductors, the Ising-nematic phases in the iron pnictides, and the valence-bond-solids in certain quantum magnets.

We discuss the interplay between the broken real-space symmetries and vacancies, impurities and other types of quenched disorder that are inevitable in real materials. Specifically, we demonstrate that spinless impurities in a frustrated Ising magnet give rise to a random-field mechanism that can destroy the stripe-ordered phase. The strength of the emerging random fields is governed by the spatial impurity distribution. Moreover, the mechanism can be tuned very efficiently by weak exchange anisotropies that explicitly break the real-space symmetry, providing a way of controlling the phase diagram of this many-particle system.

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