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Half-magnetization plateau stabilized by structural distortion in the antiferromagnetic Heisenberg model on a pyrochlore lattice

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Magnetization plateaus, visible as anomalies in magnetic susceptibility at low temperatures, are one of the hallmarks of frustrated magnetism. We show how an extremely robust half-magnetization plateau can arise from coupling between spin and lattice degrees of freedom in a pyrochlore antiferromagnet, and develop a detailed symmetry of analysis of the simplest possible scenario for such a plateau state. Classical Monte Carlo simulation and low-T expansion techniques are used to explore the finite temperature properties of the model we introduce. The application of this theory to the spinel oxides CdCr_2O_4 and HgCr_2O_4 , where a robust half magnetization plateau has been observed, is discussed.

Keywords : spinel,magnetism,plateau