Effects of a Perpendicular Magnetic Field in the Dipolar Heisenberg Model with Dominant Exchange Interaction

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Abstract:

The effects of a uniform magnetic field on the phase diagram of the dipolar Heisenberg model with a dominant antiferromagnetic exchange interaction have been investigated.

The model consists of a square lattice of classical spin vectors, where the spins interact through an antiferromagnetic exchange interaction of strength J, a magnetic surface anisotropy of strength k, a dipole-dipole interaction of strength g and couple to an applied field of strength H. In this study the applied field is assumed to be perpendicular to the plane of the lattice. From extensive Monte Carlo simulations, representative magnetic phase diagrams have been determined as a function of the ratio's k, and T/g, where T is temperature, and at three different ratios of H/g (H/g=10,~20,~27). These results are compared to the previously investigated case of H/g=0 and to analytic calculations for the ground state energies. The nature of the equilibrium phases and order of the phase boundaries separating them are considered and changes due to the strength of the applied field are highlighted.

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