Monte Carlo Study of the Anisotropic Three-Dimensional Heisenberg Model in a Crystal Field

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We study the phase diagram of the three-dimensional classical ferromagnetic Heisenberg model with an easy-plane crystalline anisotropy and an easy-axis exchange anisotropy through Monte Carlo simulations. We employ the Metropolis algorithm together with single-histogram techniques in order to characterize the transitions in each region of the phase diagram. Our results reveal, besides the disordered phase, the existence of Ising-like and XY-like ordered phases which are separated by a first-order transition line.

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