Application of the modified Pair Approximation method for Kaya-Berker model

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Up to now studies of frustrated Kaya-Berker (K-B) model [1] by means of Hard-Spin Mean-Field Theory, Effective Field Theory and Monte Carlo approach lead to some controversial results. In order to clarify the properties of that model we apply the Pair Approximation method, which has been modified for frustrated systems. In this paper, a full thermodynamic description of K-B model is obtained, based on the Gibbs free-energy analysis. The phase diagram presenting the critical (Néel) temperature is calculated and compared with other methods. In particular, we found that the ground state in K-B model is ordered for all concentrations p of magnetic atoms on one sublattice. The 1st-order phase transition at $p = 1$ and $T = 0$ is found.

References:

[1] H. Kaya, A. N. Berker, Phys. Rev E **62**, R1469 (2000)