LIEB-MATTIS MODEL FOR TWO INTERPENETRATING ANTIFERROMAGNETS

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9.7 cm

We investigate a model which can be considered as a reference model describing the unusual magnetic properties of $Ba_2Cu_3O_4Cl_2$. The main feature of this compound is the existence of two interpenetrating subsystems of antiferromagnetically coupled copper atoms, Cu(A) and Cu(B). The coupling between Cu(A) is strong while the coupling between Cu(B) is much weaker as indicated experimentally by two critical temperatures differing in one order of magnitude. An additional coupling between the subsystems gives rise to interesting frustration effects.
Our approach is an exactly solvable spin-1/2 Heisenberg model with long-range Lieb-Mattis interactions. In the limit $N \to \infty$ we get a complete thermodynamic phase diagram. We are able to calculate order parameters, correlation functions, specific heat and susceptibility. Moreover it is possible to reproduce the two observed critical temperatures.

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