Ground states of anisotropic antiferromagnets with single ion and cubic anisotropy

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Anisotropic antiferromagnets in an external magnetic field show a rich variety of different phases meeting in phase transition lines and multicritical points. We study the dependence of the ground states of these systems in the three dimensional space on physical parameters as exchange, single ion and cubic anisotropy (see [1,2]).

One identifies four different ground states: the paramagnetic, the antiferromagnetic, the spin flop and the biconical ground state. In the case of absence of a cubic anisotropy the transition lines separating the different ground states can be calculated analytically, otherwise they have to be calculated numerically. We also considered the behavior of the staggered magnetization which characterizes the different ground states. From its behavior the order of the transition from one state to the other is determined.

The results obtained may be relevant for other systems since the antiferromagnetic model can be mapped to a lattice model where the biconical phase is interpreted as supersolid phase [3]. Recent renormalization group calculations show that such a phase would indicate the existence of a tetracritical point [4].

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