MAGNETISM OF TWO-DIMENSIONAL SPIN SYSTEMS

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In this talk will be discussed:

1. The mechanisms of the magnetic ordering in two-dimensional (2D) spin systems, which can arise due to the magnetic anisotropy (d) and/or the interplane exchange interaction (λ) [1,2]. The temperature of the magnetic phase transition logarithmically depends on the parameters d and λ and one decreases down to zero for d=λ=0.

2. The mechanisms of the singlet spin state forming in 2D systems. The cases of the systems singletization will be discussed are a) by the special geometry of the exchange bonds without the magnetic phase transition [3], b) by the magnetoelastic coupling with the magnetic phase transition [4]. In the first case the singlet spin state is the result of the freezing of the populations of the triplet excited states and the transition of the spin system to the singlet ground state at the temperature T？ 0 K. In the second case the initial state of 2D lattice transits to the plaquette lattice state by phase transition when the magnetoelastic coupling parameter reaches the some critical value. In this case the spin system with the antiferromagnetic exchange bonds transits to the state with the singlet ground state separated from the excited triplet states by the energy gap (it is analogue to the spin-Peierls phase transition in 1D spin system). The magnetic excitation spectrum of such system has the energy gap.

3.The magnetic properties of 2D crystal spin system of $Cu_3B_2O_6$ will be discuss as the possible candidate of 2D spin system with the magnetic phase transition to the singlet state.

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