CRITICAL TEMPERATURE STUDIES OF THE ANISOTROPIC BI- AND MULTILAYER HEISENBERG FERROMAGNETS

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9.7 cm

The Pair Approximation (PA) method is applied to studies of the planar ferromagnetic systems with directional and spin-space anisotropy of interactions. The approach used allows to take into account arbitrary couplings, ranging from Ising to isotropic Heisenberg interactions, independently within each plane and for interplanar coupling. The self-consistent thermodynamic description of the model is achieved on the basis of the Gibbs energy analysis.

The study is focused on the Curie temperature, for which an extensive comparison between the bilayer (consisting of two atomic planes) and the corresponding multilayer (composed of infinite number of atomic planes) is performed. It is found that for the isotropic Heisenberg intraplanar interactions the Curie temperature decreases logarithmically with vanishing interplanar coupling. The compensation point for Heisenberg coupling at which the critical temperature is not influenced by interplanar interactions is found in the Ising bilayer system with unequal in-plane exchange integrals. It is shown that an unlimited increase in the interplanar coupling in the bilayer system always leads to the saturation of the Curie temperature with finite limiting value. A similar phenomenon exists in the multilayer system, but only with Heisenberg interactions between planes. The results of numerical calculations are discussed and presented in figures.

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