

PHASE DIAGRAMS AND MULTICRITICAL POINTS IN THE TERNARY MIXED-SPIN ALLOY WITH A SINGLE-ION ANISOTROPY

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The phase diagram of the AB_pC_{1-p} ternary alloy consisting of different Ising spins $S^A=3/2$, $S^B=2$, and $S^C=5/2$ in the presence of a single-ion anisotropy is investigated by the use of a mean-field theory based on the Bogoliubov inequality for the Gibbs free energy. The structure and spin values correspond to the Prussian blue analog of the type $(Fe_p^{II}Mn_{1-p}^{II})_{1.5}[Cr^{III}(CN)_6].zH_2O$ [1] and the couplings between the A and X ($X = B$ or C) ions include both ferromagnetic ($J_{AB} > 0$) and antiferromagnetic ($J_{AC} < 0$) interactions. Depending on the values of the parameters in the model Hamiltonian, the phase diagram exhibits a quite rich structure, with several multicritical points such as tricritical point, critical end point and isolated critical point. The calculated phase diagrams are conveniently controlled in the limit $T \rightarrow 0$ K where, for the ground state, the exact results have been obtained.

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[1] S.Ohkoshi, S.Yorozu, O.Sato, T.Iyoda, A.Fujishima and K.Hashimoto, Appl. Phys. Lett. 70 (1997) 1040.

9.7 cm

13.4 cm

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