PHASE TRANSITIONS IN MONOPNICTIDES AND MONOCHALCOGENIDES

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9.7 cm

We consider a wide class of antiferromagnets with a NaCl structure. This class includes binary compounds: monopnictides and monochacogenides of actinides and lanthanides; monoxides MnO, CoO, FeO, NiO; and also MnS and MnSe; and ternary compounds with partial substitution of cations and anions. These antiferromagnets possess very peculiar features that did not obtain the adequate explanation within the framework of existing theoretical models and approaches. In particular, a wide variety of changing magnetic structures with varying temperature and magnetic field, coincidence of magnetic and structural phase transitions of the first order, very strong anisotropy, very special diffuse magnetic neutron scattering above phase transition points, and so on. On the base of magnetic modified 6-state Potts model (for compounds with oblate distortion of magnetic cations) and 8-state Potts model (for compounds with prolate distortion of magnetic cations), we developed a theory of simultaneous magnetic and structural phase transitions of the first order for antiferromagnets with a NaCl structure and with a strong cubic magnetic anisotropy. Temperature evolution of diffuse magnetic scattering of neutrons is calculated and it is shown that the mechanism of the phase transition is conditioned by the high-temperature diffuse scattering transformation into magnetic Bragg reflections below Néel point.

13.4 cm

Subject category :

3. Magnetic Structure and Dynamics

Presentation mode :
poster

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