9.7 cm

SPONTANEOUS AND FIELD INDUCED PHASE TRANSITIONS IN FERRIMAGNETS WITH INTRA-SUBLATTICE ANTIFERROMAGNETIC EXCHANGE INTERACTION

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Ternary intermetallic compounds of heavy rare earths and manganese, RMn_2X_2 with X=Si or Ge in particular, both pure and doped, are characterized by the R-Mn and Mn-Mn antiferromagnetic exchange interactions at certain temperature intervals. Complex magnetic structures and various phase transitions, both spontaneous and induced by magnetic fields of different orientations with respect to the tetragonal crystal axis, are observed in them. Magnetic phase transitions feasible in a ferrimagnet with intra-sublattice antiferromagnetic exchange interaction are calculated in this work for an arbitrary anisotropy case. The magnetic phase diagrams, temperature, angular and concentration dependences of the phase transition fields are derived. In the limiting case of zero anisotropy two kinds of the second order phase transitions to the non-collinear or spin-flip phases are possible whereas in the Ising case three types of metamagnetic transitions exist depending on the exchange parameters relation. For finite anisotropy constant the critical fields show complicated temperature and angular dependences. The theory allows for a rather successful description of the phase transitions observed in the compounds of the RMn_2Ge_2 type with R=Gd & Dy, among them a very interesting case of metamagnetic transition in $GdMn_2Ge_2$ for a field perpendicular to the tetragonal axis.

13.4 cm

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