

Effect of Tb/Gd substitution on crystal structure and exchange interactions of $Tb_xGd_{1-x}Ni_3$ intermetallic compounds

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Intermetallic compounds of rare earth (RE) and transition (T) elements are very interesting from scientific point of view because of a mixture of localized (RE) and itinerant (T) magnetism. In the paper an influence of Tb/Gd substitution on crystal structure and exchange interactions of $Tb_xGd_{1-x}Ni_3$ ($x = 0.0, 0.2, 0.5, 0.8, 1.0$) polycrystalline compounds have been studied. The crystal structure of all samples was checked at the room temperature by means of X-ray diffraction (XRD). Exchange integrals of RE-RE (J_{RE-RE}), T-T (J_{T-T}) and RE-T (J_{RE-T}) atoms were evaluated from $M(T)$ magnetization curves (2 K - 300 K, 2 T) based on the mean field theory (MFT) calculation. As it was shown the samples examined are single phase and crystallize in the $PuNi_3$ (space group R-3m) type of crystal structure. The Tb/Gd substitution causes the decrease of lattice parameters as well as the volume of the unit cell. A variation of the J_{RE-RE} , J_{T-T} and J_{RE-T} parameters in a context of the structural changes are also widely discussed.

13.4 cm

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9.7 cm