

Effect of Tb substitution structural and magnetic properties of $\text{La}_{1-x}\text{Tb}_x\text{Mn}_2\text{Si}_2$ ($0 \leq x \leq 0.5$)

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rare-earth compounds; transition metal compounds; magnetic

Keywords: rare-earth compounds; transition metal; magnetic measurements

The structure and magnetic properties of $\text{La}_{1-x}\text{Tb}_x\text{Mn}_2\text{Si}_2$ ($0 \leq x \leq 0.5$) were studied by X-ray powder diffraction and magnetization measurements. All the compounds crystallize ThCr_2Si_2 -type structure[1]. Linear decrease in the lattice constants and the unit-cell volume is observed by substituting Tb. Ferromagnetism is observed up to $x=0.3$ samples. However T_C shifts to lower temperatures as the Tb content increase. Increasing Tb concentration causes, decrease of ferromagnetic ordering and increase antiferromagnetic ordering. This ferromagnetic to antiferromagnetic phase transition leads to an intermediate phase. Thermal contraction of the lattice parameter a causes this intermediate phase. For $x < 0.3$ splitting between the ZFC and FC curves is observed at T_C which indicates the ferromagnetic component of the Mn moments is pinned by the anisotropy of the in-plane antiferromagnetic component.

[1] A. Szytula, J. Leciejewicz, in: K.A. Gschneidner Jr., L. Eyring(Eds.), Handbook on the Physics and Chemistry of Rare Earths, vol. 12, 1989, p. 133.