

Electronic and magnetic properties of SmFe_{1-x}Mn_xO₃ orthoferrites (x=0.1, 0.2, and 0.3)

Bouziane K., Yousif A., Abdel-Latif I., Hricovini K., Richter C.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The electronic and magnetic properties of the orthoferrites SmFe_{1-x}Mn_xO₃ (x=0.1, 0.2, and 0.3) have been investigated. The Mössbauer data show that the iron ions at different nonequivalent octahedral sites have essentially a trivalent state. Resonant inelastic x-ray emission measurements performed at Fe L₃ edge and Mn L₃ edge show clearly that Fe ions and Mn ions have the same electronic structure. The temperature-dependent magnetization shows that the Curie temperature of the weak-ferromagnetic SmFeO₃ decreases as Fe ions are substituted by Mn ions. A spin-reorientation transition from weak-ferromagnetism to antiferromagnetism seems to take place at low temperature, and the corresponding transition temperature essentially decreases as the Mn content increases. The effect of the substitution of Fe ions by Mn ions in SmFeO₃ on the double exchange and the critical temperatures is analyzed and discussed. © 2005 American Institute of Physics.

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