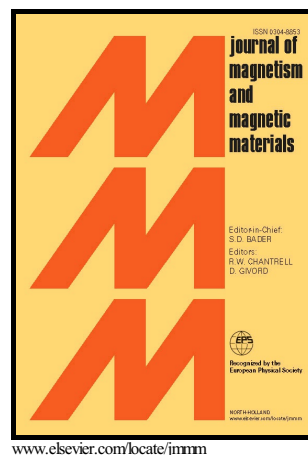


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PII: S0304-8853(16)32707-X
DOI: <http://dx.doi.org/10.1016/j.jmmm.2016.12.070>
Reference: MAGMA62278

To appear in: *Journal of Magnetism and Magnetic Materials*

Received date: 22 October 2016
Revised date: 12 December 2016
Accepted date: 17 December 2016

Cite this article as: Masakazu Ito, Tatsuya Furuta, Keita Kai, Atsushi Taira, Keiji Onda, Iduru Shigeta and Masahiko Hiroi, Thermodynamic Properties of Heusler $\text{Fe}_{2-x}\text{Co}_x\text{MnSi}$, *Journal of Magnetism and Magnetic Materials* <http://dx.doi.org/10.1016/j.jmmm.2016.12.070>

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Thermodynamic Properties of Heusler $\text{Fe}_{2-x}\text{Co}_x\text{MnSi}$

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Abstract

We investigated the thermodynamic properties of Heusler compounds $\text{Fe}_{2-x}\text{Co}_x\text{MnSi}$ ($0.00 \leq x \leq 2.00$). The specific heats $C_P(T)$ for compounds with $x \leq 0.1$ exhibit a λ -type anomaly arising from spin rearrangements at T_R . With increasing x , T_R decreases linearly and vanishes at $x \sim 0.169$. The magnetic entropy, S_{T_R} , derived from the magnetic specific heat, $C_m(T)$, released at T_R decreases by increasing x . This means the canting angle of spins from the [111] direction decreases by the substitution of Fe atoms with Co atoms, based on the magnetic structure model of Fe_2MnSi proposed by Miles et al. For compounds with $0.5 \leq x$, $C_P(T)$ in the low- T range can be reproduced by Debye T^3 law. The electronic specific heat coefficient decreases monotonically with x .

Keywords: Heusler compound; Specific heat; Magnetic ordering

1. Introduction

Full-Heuser compounds are alloys having chemical formula X_2YZ for which X and Y are transition metals and Z is a non-magnetic *sp* element. They belong to a material group that are attractive for their various interesting magnetic, electrical, and thermodynamic properties, such as the magnetic shape memory effect in the Ni-Fe-Ga[1] and Fe-Mn-Ga[2] systems, thermoelectricity in F-V-Al system[3], and a magnetocaloric effect in the Ni-Mn-In and Ni-Mn-Sn systems[4]. Half-metallicity is also another property that is expected to have applications in spintronics devices such as tunneling magneto-

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