

Accepted Manuscript

Effect of Cu substitution on magnetocaloric and critical behavior in
 $\text{Ni}_{47}\text{Mn}_{40}\text{Sn}_{13-x}\text{Cu}_x$ alloys

A. Ghotbi Varzaneh, P. Kameli, T. Amiri, K.K. Ramachandran, A. Mar, I.
Abdolhosseini Sarsari, J.L. Luo, T.H. Etsell, H. Salamati

PII: S0925-8388(17)30726-0

DOI: [10.1016/j.jallcom.2017.02.278](https://doi.org/10.1016/j.jallcom.2017.02.278)

Reference: JALCOM 41006

To appear in: *Journal of Alloys and Compounds*

Received Date: 16 November 2016

Revised Date: 23 February 2017

Accepted Date: 27 February 2017

Please cite this article as: A.G. Varzaneh, P. Kameli, T. Amiri, K.K. Ramachandran, A. Mar, I.A. Sarsari, J.L. Luo, T.H. Etsell, H. Salamati, Effect of Cu substitution on magnetocaloric and critical behavior in $\text{Ni}_{47}\text{Mn}_{40}\text{Sn}_{13-x}\text{Cu}_x$ alloys, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.02.278.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Effect of Cu Substitution on Magnetocaloric and Critical Behavior in $\text{Ni}_{47}\text{Mn}_{40}\text{Sn}_{13-x}\text{Cu}_x$ Alloys

A. Ghotbi Varzaneh¹, P. Kameli¹, T. Amiri², K. K. Ramachandran³, A. Mar³,
I. Abdolhosseini Sarsari¹, J. L. Luo², T. H. Etsell², H. Salamati¹

¹ Department of Physics, Isfahan University of Technology, Isfahan, 84156-83111, Iran.

² Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta T6G 1H9, Canada

³ Department of Chemistry, University of Alberta, Edmonton, Alberta T6G 2G2, Canada

Abstract

A series of Heusler phases $\text{Ni}_{47}\text{Mn}_{40}\text{Sn}_{13-x}\text{Cu}_x$ ($x = 0, 0.5, 1, 1.25$), which are magnetic shape-memory alloys, has been synthesized by mechanical alloying (MA) and characterized. The martensite-austenite phase transition was investigated by X-ray diffraction, differential scanning calorimetry, and DC magnetization measurements. With greater Cu content, the martensitic transition temperature T_M increases while the magnetic transition temperature of austenite T_c^A remains almost unchanged. The maximum inverse magnetic entropy changes ΔS_M for the $x = 0.5$ and $x = 1$ samples are nearly twice as high as for the undoped sample. Furthermore, the martensitic transformation of the doped samples occurs around room temperature, which is important for applications. Effective refrigerant capacities (RC_{eff}) reduced due to the higher hysteresis losses in the $x = 0.5$ and $x = 1$ samples compare to the undoped one. Refrigerant capacities (RC) were examined in T_c^A . The largest value of $\text{RC} = 207 \text{ J/kg}$ was measured for the undoped sample. Critical properties near the ferromagnetic-paramagnetic (FM-PM) phase transition were analyzed in detailed. The critical parameters β , γ , δ and T_c^A of the $x = 0$ and $x = 0.5$ samples, which were determined through use of modified Arrott plots, the Kouvel-Fisher method, and the Widom scaling relation, differed from the mean-field values. The critical behavior indicates that long-range ferromagnetic order dominates in these Cu-doped samples.

Keywords: Martensitic transformation, Magnetocaloric effect, Critical behavior.

Download English Version:

<https://daneshyari.com/en/article/5459487>

Download Persian Version:

<https://daneshyari.com/article/5459487>

[Daneshyari.com](https://daneshyari.com)