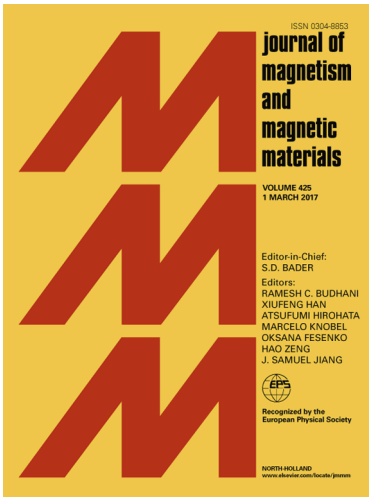

Analysis of Electronic, Magnetic and Half-Metallic Properties of $L2_1$-type ($Co_2Mn_{0.5}Fe_{0.5}Sn$) Heusler alloy Nanowires synthesized by AC-electrodeposition in AAO templates

Suleman khan, Naeem Ahmed, Nisar Ahmad, X.F. Han

PII: S0304-8853(17)33751-4
DOI: https://doi.org/10.1016/j.jmmm.2018.03.028
Reference: MAGMA 63799

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

Received Date: 3 December 2017
Revised Date: 27 February 2018
Accepted Date: 13 March 2018

Please cite this article as: S. khan, N. Ahmed, N. Ahmad, X.F. Han, Analysis of Electronic, Magnetic and Half-Metallic Properties of $L2_1$-type ($Co_2Mn_{0.5}Fe_{0.5}Sn$) Heusler alloy Nanowires synthesized by AC-electrodeposition in AAO templates, *Journal of Magnetism and Magnetic Materials* (2018), doi: https://doi.org/10.1016/j.jmmm.2018.03.028

Analysis of Electronic, Magnetic and Half-Metallic Properties of $L2_1$-type ($Co_2Mn_{0.5}Fe_{0.5}Sn$) Heusler alloy Nanowires synthesized by AC-electrodeposition in AAO templates

Suleman khan[1], Naeem Ahmed[1,2], Nisar Ahmad[3], X.F. Han[2]

1. Spintronics Laboratory, Department of Physics, International Islamic University, Islamabad Pakistan.
2. Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, University of Chinese Academy of Sciences, Beijing, 100190, China
3. Department of Physics and Applied Mathematics, Pakistan Institute of Engineering and Applied Sciences, Islamabad, Pakistan

Corresponding author email: naeem.ahmad@iiu.edu.pk

Abstract

In order to investigate the structural, magnetic and electronics properties, Co-based ($Co_2Mn_{0.5}Fe_{0.5}Sn$) full Heusler compound nanowires were synthesized for the first time using alternating current (AC) deposition in anodized alumina oxide (AAO) templates. The half-metallicity, band gap and 100% spin polarization was also confirmed using the art of full potential linearized augmented plane wave methods (FP-LAPW) within density functional theory (DFT). The SEM images have confirmed the average diameter of templates and nanowires 62 nm and 58 nm respectively. The XRD confirms the formation of full Heusler alloy, $L2_1$ (A2 & B2 type disorder) type crystal structure. Energy dispersive X-Ray spectroscopy (EDX) technique shows Tin (Sn) decreases whereas (Co, Fe & Mn) almost increases with increase in deposition potential. The M-H loops show the variation of coercivity and saturation magnetization with respect to deposition potential. Two probe I-V curves show that resistance decreases w.r.t deposition voltage. The resistivity and carrier concentration were decreased in a similar fashion w.r.t increased in deposition voltage where as mobility was increased with increase in deposition voltage which show the increment of the grain size and diminish the scattering of electron grain