

Magnetic properties of half-metallic semi Heusler $\text{Co}_{1-x}\text{Cu}_x\text{MnSb}$ compounds

Duong N.P., Hung L.T., Hien T.D., Thuy N.P., Trung N.T., Bruck E.

International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam; Faculty of Electronics and Telecommunication, College of Technology, Vietnam National University, Hanoi, 140 Xuan Thuy Road, Cau Giay, Hanoi, Viet Nam; Van der Waals-Zeeman Instituut, Universiteit van Amsterdam, Valckenierstraat 65, 1018 XE, Amsterdam, Netherlands

Abstract: A study of the half-metallic character of the semi Heusler alloys $\text{Co}_{1-x}\text{Cu}_x\text{MnSb}$ ($0 \leq x \leq 0.9$) is presented. We investigated the saturation magnetization M_S at temperatures from 5 K to room temperature and the temperature dependence of the DC magnetic susceptibility χ above Curie temperature T_C . The magnetic moments at 5 K, for most compositions are very close to the quantized value of $4 \mu_B$ for Mn^{3+} ion, the compound with 90% Co substituted by Cu is still ferromagnetic with $M_S(5 \text{ K}) = 3.78 \mu_B/\text{f.u.}$ These results emphasize the role of Co atoms in maintaining the ferromagnetic order in the material. The Curie temperature is decreased from 476 K to about 300 K as the Cu content increases from 0% to 90%. Above T_C , the χ^{-1} vs T curves follow very well the Curie-Weiss law. The effective moment μ_{eff} and paramagnetic Curie temperature θ_p are derived. A comparison between the values of M_S at 5 K and μ_{eff} shows a transition from localized to itinerant spin system in these compounds. ?? 2006 Elsevier B.V. All rights reserved.

Author Keywords: $\text{Co}_{1-x}\text{Cu}_x\text{MnSb}$; Ferromagnets; Half-metals; Heusler alloys; Itinerant electrons; Localized electrons

Index Keywords: Cobalt alloys; Ferromagnetic materials; Magnetic properties; Magnetic susceptibility; Phase transitions; Half-metals; Heusler alloys; Itinerant electrons; Localized electrons; Alloying elements

Year: 2007

Source title: Journal of Magnetism and Magnetic Materials

Volume: 311

Issue: 2

Page : 605-608

Cited by: 4

Link: [Scopus Link](#)

Correspondence Address: Duong, N.P.; International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam; email: duong@itims.edu.vn

ISSN: 3048853

CODEN: JMMMD

DOI: 10.1016/j.jmmm.2006.08.023

Language of Original Document: English

Abbreviated Source Title: Journal of Magnetism and Magnetic Materials

Document Type: Article

Source: Scopus

Authors with affiliations:

1. Duong, N.P., International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam
2. Hung, L.T., International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam
3. Hien, T.D., International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam
4. Thuy, N.P., International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam, Faculty of Electronics and Telecommunication, College of Technology, Vietnam National University, Hanoi, 140 Xuan Thuy Road, Cau Giay, Hanoi, Viet Nam
5. Trung, N.T., International Training Institute for Materials (ITIMS), Hanoi University of Technology, 1 Dai Co Viet Road, Hanoi, Viet Nam, Van der Waals-Zeeman Instituut, Universiteit van Amsterdam, Valckenierstraat 65, 1018 XE, Amsterdam, Netherlands
6. Br?ck, E., Van der Waals-Zeeman Instituut, Universiteit van Amsterdam, Valckenierstraat 65, 1018 XE, Amsterdam, Netherlands

References:

1. Hordequin, C., Pierre, J., Currat, R., (1996) J. Magn. Magn. Mater., 162, p. 75
2. Forster, H., Johnston, G.B., Wheeler, D.A., (1968) J. Phys. Chem. Solids, 29, p. 855
3. de Groot, R.A., Mueller, F.M., van Engen, P.G., Buschow, K.H.J., (1983) Phys. Rev. Lett., 50, p. 2024
4. Mazin, I.I., Singh, D.J., Claudia Ambrosch-Draxl (1999) Phys. Rev. B, 441 (8), p. 59
5. Otto, M.J., van Woerden, R.A.M., van der Valk, P.J., Wijngaard, J., van Bruggen, C.F., Haas, C., Buschow, K.H.J., (1989) J. Phys. Condens. Matter, 1, p. 2341
6. Galanakis, I., Dederichs, P.H., Papanikolaou, N., (2002) Phys. Rev. B, 66, p. 134428
7. Natera, M.G., Murthy, M.R.L.N., Begum, R.J., Satya Murthy, N.S., (1970) Phys. Status Solidi a, 3, p. 959
8. Szytula, A., Dimitrijevic, Z., Todorovic, T., Kolodziejczyk, A., Szelag, J., Wanic, A., (1972) Phys. Status Solidi a, 9, p. 97
9. Ren, S.K., Zou, W.Q., Gao, J., Jiang, X.L., Zhang, F.M., Du, Y.W., (2005) J. Magn. Magn. Mater., 288, p. 276
10. Rhodes, P., Wohlfarth, E.P., (1963) Proc. R. Soc. A, 273, p. 247
11. Wohlfarth, E.P., (1978) J. Magn. Magn. Mater., 7, p. 113

Download Full Text: 0592.pdf