Band metamagnetism and related phenomena in $Er(Co_{1-x}Si_x)_2$

Cuong T.D., Havela L., Sechovsky V., Andreev A.V., Arnold Z., Kamarad J., Duc N.H.

Department of Metal Physics, Charles University, Ke Karlovu 5, CZ-121 16 Praha 2, Czech Republic; Institute of Physiscs, Acad. of Sci. of the Czech Republic, Cukrovarnick? 10, CZ-162 00 Praha 6, Czech Republic; Physics Department, College of Natural Science, National University of Hanoi, Viet Nam

Abstract: We report on magnetic, transport, and cohesive properties of $Er(Co_{1-x}Si_x)_2$ compounds in varying external conditions (T,H,p). The localized Er 4f magnetice moments in $ErCo_2$ order ferromagnetically below T_c=33 K. The Co 3d band states form no moment above T_c, but below T_c the majority and minority 3d sub-bands split due to strong 4f - 3d exchange interaction Consequently, Co moments of ?1 $?_B$ appear coupled antiparallel to the Er moments. This is accompanied by a ?50% resistivity drop and an abrupt lattice expansion. The sharp magnetization, resistivity, and volume anomalies in the critical temperature region indicate a first order magnetic phase transition. Detailed comparative studies reveal that the onset of Co magnetizm appears at T_0?(T_C-1) K. Si substitution for Co enhances both, T_c (up to 66 K for x = 0.1) and ??T=T_c-T_0, but the lattice parameter remains unchanged. In opposite, both the magnetovolume and resistivity anomaly at T_0 become reduced. Pressure effect on T_c(T_0) is large and negative, ??In T_c/??p? - 28 $Mbar^{-1}$ for all x??0.1. Also the resistivity drop at T_0 and the magnetovolume effect (??$_s$ = 3 ??L/L=4.2??10^{-3} in $ErCo_2$) below T_0 become reduced with increasing pressure. The latter is reflecting reduction of the Co moment gained below T_0. ?? 1997 American Institute of Physics.

Year: 1997
Source title: Journal of Applied Physics
Volume: 81
Issue: 8 PART 2A
Page : 4221-4223
Cited by: 18
Link: Scorpus Link
Correspondence Address: Sechovsk?, V.; Department of Metal Physics, Charles University, Ke Karlovu 5, CZ-121 16 Praha 2, Czech Republic; email: sech@mag.mff.cuni.cz
ISSN: 218979
CODEN: JAPIA
Language of Original Document: English
Abbreviated Source Title: Journal of Applied Physics
Document Type: Article
Source: Scopus
Authors with affiliations:
1. Cuong, T.D., Department of Metal Physics, Charles University, Ke Karlovu 5, CZ-121 16 Praha 2, Czech Republic

2. Havela, L., Department of Metal Physics, Charles University, Ke Karlovu 5, CZ-121 16 Praha 2, Czech Republic
3. Sechovsk?, V., Department of Metal Physics, Charles University, Ke Karlovu 5, CZ-121 16 Praha 2, Czech Republic
4. Andreev, A.V., Institute of Physiscs, Acad. of Sci. of the Czech Republic, Cukrovarnick? 10, CZ-162 00 Praha 6, Czech Republic
5. Arnold, Z., Institute of Physiscs, Acad. of Sci. of the Czech Republic, Cukrovarnick? 10, CZ-162 00 Praha 6, Czech Republic
6. Kamar?d, J., Institute of Physiscs, Acad. of Sci. of the Czech Republic, Cukrovarnick? 10, CZ-162 00 Praha 6, Czech Republic
7. Duc, N.H., Physics Department, College of Natural Science, National University of Hanoi, Viet Nam

References:

1. Goto, T., Aruga Katori, H., Sakakibara, T., Mitamura, H., Fukamichi, K., Murata, K., (1994) J. Appl. Phys., 76, p. 6682. , and references therein
2. Duc, N.H., Hien, T.D., Brommer, P.E., Franse, J.J.M., (1992) J. Magn. Magn. Mater., 104, p. 1252. , and references therein
3. Pillmayr, N., Hilscher, G., Forshuber, M., Yoshimura, K., (1990) J. Magn. Magn. Mater., 90, p. 964
4. Duc, N.H., (1994) J. Magn. Magn. Mater., 131, p. 224
5. Duc, N.H., Brommer, P.E., Li, X., De Boer, F.R., Franse, J.J.M., (1993) Physica B, 212, p. 83
6. Armitage, J.G.M., Graham, R.G., Riedi, P.C., Abell, J.S., (1990) J. Phys., Condens. Matter, 2, p. 8779
7. Duc, N.H., Voiron, J., Holtmeier, S., Haen, P., Li, X., (1993) J. Magn. Magn. Mater., 125, p. 323
8. Dubenko, I.S., Levitin, R.Z., Markosyan, A.S., Silant'ev, V.I., Snegirev, V.V., (1991) J. Magn. Magn. Maier., 94, p. 287
9. Aoki, M., Yamada, H., (1992) Physica B, 177, p. 259
10. Murata, K., Fukamichi, K., Goto, T., Suzuki, K., Sakakibara, T., (1994) J. Phys., Condens. Matter., 2, p. 6659
11. Due, N.H., (1996) J. Magn. Magn. Mater., 152, p. 317
12. Michels, D., Timlin, J., Mihalisin, T., (1990) J. Appl. Phys., 67, p. 5289
13. Due, N.H., Brommer, P.E., Cuong, T.D., Sechovsky, V., Arnold, Z., Kamar?d, J., unpublishedAleksandryan, V.V., Baranov, N.V., Kozlov, A.I., Markosyan, A.S., (1988) Fiz. Met. Metalloved., 66, p. 714
14. Duc, N.H., Hien, T.D., Levitin, R.Z., Markosyan, A.S., Brommer, P.E., Franse, J.J.M., (1992) Physica B, 176, p. 232
15. Gratz, E., Bauer, E., Hauser, R., Maikis, M., Haen, P., Markosyan, A., (1993) Int. J. Mod. Phys. A, 7, p. 366
16. Inoue, J., Shimizu, M., (1982) J. Phys. F, 12, p. 1811
17. Brommer, P., (1989) Physica B, 154, p. 197