Effects of dilution on magnetic and transport properties of La0.7 Ca0.3 Mn1-x Mx′ O3

Nam D.N.H., Dai N.V., Thanh T.D., Tuong L.T.C., Hong L.V., Phuc N.X., Hong H.S., Khien N.V.
Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam; College of Technology, Hanoi National University, Hanoi, Viet Nam

Abstract: Magnetic and transport properties of La0.7 Ca0.3 Mn1-x Mx′ O3 (M′ =Al,Ti) are studied. The dilution of the Mn network results in a weakening of the ferromagnetism, a deterioration of the metallic conductivity, and a strong enhancement of the magnetoresistance. Although Tc linearly decreases with x in the low substitution ranges for both M′ series, the scaling behavior Tc (np) previously observed for La0.7 Sr0.3 Mn1-x Mx′ O3 is no longer obtained. Extrapolations of the Tc (np) linear curves to Tc =0K give np values much smaller than one. These results suggest that, according to a molecular-field approximation, antiferromagnetic superexchange between Mn ions is significant in La0.7 Ca0.3 MnO3, in contrast to what was observed in La0.7 Sr0.3 MnO3. Additionally, the structural data of the Al-substituted samples suggest that variations of the eg -electron bandwidth W cannot explain the decrease in Tc in magnetically diluted manganites.

Year: 2008
Source title: Physical Review B - Condensed Matter and Materials Physics
Volume: 77
Issue: 22
Art. No.: 224420
Cited by: 1
Link: Scorpus Link
Correspondence Address: Nam, D. N. H.; Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam; email: daonhnam@yahoo.com
ISSN: 10980121
CODEN: PRBMD
DOI: 10.1103/PhysRevB.77.224420
Language of Original Document: English
Abbreviated Source Title: Physical Review B - Condensed Matter and Materials Physics
Document Type: Article
Source: Scopus
Authors with affiliations:

- Nam, D.N.H., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam
- Dai, N.V., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam
- Thanh, T.D., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam
- Tuong, L.T.C., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam
- Hong, L.V., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam

- Phuc, N.X., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam
- Hong, H.S., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam, College of Technology, Hanoi National University, Hanoi, Viet Nam
- Khien, N.V., Institute of Materials Science, VAST, 18 Hoang-Quoc-Viet, Hanoi, Viet Nam, College of Technology, Hanoi National University, Hanoi, Viet Nam

References:

- Kusters, R.M., Singleton, J., Keen, D.A., McGreevy, R., Hayes, W., (1989) Physica B (Amsterdam), 155, p. 362. , 0921-4526
- Von Helmolt, R., Wecker, J., Holzapfel, B., Schultz, L., Samwer, K., (1993) Phys. Rev. Lett., 71, p. 2331. , PRLTAO 0031-9007 10.1103/PhysRevLett.71.2331
- Jin, S., Tiefel, T.H., McCormac, M., Fastnacht, R.A., Ramesh, R., Chen, L.H., (1994) Science, 264, p. 413. , SCIEAS 0036-8075 10.1126/science.264.5157.413
- Zener, C., (1951) Phys. Rev., 82, p. 403. , PHRVAO 0031-899X 10.1103/PhysRev.82.403
- Dagotto, E., Hotta, T., Moreo, A., (2001) Phys. Rep., 344, p. 1. , PRPLCM 0370-1573 10.1016/S0370-1573(00)00121-6
- Coey, J.M.D., Viret, M., Von Molnár, S., (1999) Adv. Phys., 48, p. 167. , ADPHAH 0001-8732 10.1080/000187399243455
- Hwang, H.Y., Cheong, S.W., Radaelli, P.G., Marezio, M., Batlogg, B., (1995) Phys. Rev. Lett., 75, p. 914. , PRLTAO 0031-9007 10.1103/PhysRevLett.75.914
- De Teresa, J.M., Ibarra, M.R., García, J., Blasco, J., Ritter, C., Algarabel, P.A., Marquina, C., Del Moral, A., (1996) Phys. Rev. Lett., 76, p. 3392. , PRLTAO 0031-9007 10.1103/PhysRevLett.76.3392
- Arulraj, A., Santhosh, P.N., Gopalan, R.S., Guha, A., Raychaudhuri, A.K., Kumar, N., Rao, C.N.R., (1998) J. Phys.: Condens. Matter, 10, p. 8497. , JCOMEL 0953-8984 10.1088/0953-8984/10/38/010
- Nam, D.N.H., Bau, L.V., Khiem, N.V., Dai, N.V., Hong, L.V., Phuc, N.X., Newrock, R.S., Nordblad, P., (2006) Phys. Rev. B, 73, p. 184430. , PRBMDO 0163-1829 10.1103/PhysRevB.73.184430
- Turilli, G., Licci, F., (1996) Phys. Rev. B, 54, p. 13052. , PRBMDO 0163-1829 10.1103/PhysRevB.54.13052
- Li, R.W., Wang, Z.H., Chen, X., Sun, J.R., Shen, B.G., Yan, C.H., (2000) J. Appl. Phys., 87, p. 5597. , JAPIAU 0021-8979 10.1063/1.372462
- Liu, X., Xu, X., Zhang, Y., (2000) Phys. Rev. B, 62, p. 15112. , PRBMDO 0163-1829 10.1103/PhysRevB.62.15112
- Liu, Y.H., Huang, B.X., Zhang, R.Z., Yuan, X.B., Wang, C.J., Mei, L.M., (2004) J. Magn. Magn. Mater., 269, p. 398. , JMMMDC 0304-8853 10.1016/j.jmmm.2003.07.001
- Cao, D., Bridges, F., Anderson, M., Ramirez, A.P., Olapinski, M., Subramanian, M.A., Booth, C.H., Kwei, G.H., (2001) Phys. Rev. B, 64, p. 184409. , PRBMDO 0163-1829 10.1103/PhysRevB.64.184409
- Lakshmi, L.S., Rawat, R., Sridharan, V., Sastry, V.S., (2008) J. Magn. Magn. Mater., 320, p. 150. , JMMMDC 0304-8853 10.1016/j.jmmm.2007.05.017
- Blasco, J., García, J., De Teresa, J.M., Ibarra, M.R., Perez, J., Algarabel, P.A., Marquina, C., Ritter, C., (1997) Phys. Rev. B, 55, p. 8905. , PRBMDO 0163-1829 10.1103/PhysRevB.55.8905
- Krishnan, R.V., Banerjee, A., (2000) J. Phys.: Condens. Matter, 12, p. 3835. , JCOMEL 0953-8984 10.1088/0953-8984/12/16/306
- Nair, S., Banerjee, A., (2004) J. Phys.: Condens. Matter, 16, p. 8335. , JCOMEL 0953-8984 10.1088/0953-8984/16/46/019
- Shannon, R.D., (1976) Acta Crystallogr., Sect. A: Cryst. Phys., Diffr., Theor. Gen. Crystallogr., 32, p. 751. , ACACBN 0567-7394 10.1107/S0567739476001551
- Qin, H., Hu, J., Chen, J., Niu, H., Zhu, L., (2003) J. Magn. Magn. Mater., 263, p. 249. , JMMMDC 0304-8853 10.1016/S0304-8853(02)01571-8

- Sawaki, Y., Takenaka, K., Osuka, A., Shiozaki, R., Sugai, S., (2000) Phys. Rev. B, 61, p. 11588. , PRBMDO 0163-1829 10.1103/PhysRevB.61.11588
- Hu, J., Qin, H., Chen, J., Wang, Z., (2002) Mater. Sci. Eng., B, 90, p. 146. , MSBTEK 0921-5107 10.1016/S0921-5107(01)00927-8
- Kallel, N., Dezanneau, G., Dhahri, J., Oumezzine, M., Vincent, H., (2003) J. Magn. Magn. Mater., 261, p. 56. , JMMMDC 0304-8853 10.1016/S0304-8853(02)01413-0
- Kim, M.S., Yang, J.B., Cai, Q., Zhou, X.D., James, W.J., Yelon, W.B., Parris, P.E., Malik, S.K., (2005) Phys. Rev. B, 71, p. 014433. , PRBMDO 0163-1829 10.1103/PhysRevB.71.014433
- Radaelli, P.G., Iannone, G., Marezio, M., Hwang, H.Y., Cheong, S.-W., Jorgensen, J.D., Argyriou, D.N., (1997) Phys. Rev. B, 56, p. 8265. , PRBMDO 0163-1829 10.1103/PhysRevB.56.8265
- Moussa, F., Hennion, M., Rodriguez-Carvajal, J., Moudden, H., Pinsard, L., Revcolevschi, A., (1996) Phys. Rev. B, 54, p. 15149. , PRBMDO 0163-1829 10.1103/PhysRevB.54.15149