Magnetic study of nanocrystalline iron particles in alumina matrix

Fnidiki A., Dorien C., Richomme F., Teillet J., Lemarchand D., Duc N.H., Ben Youssef J., Le Gall H.
Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France; Cryogenic Laboratory, Faculty of Physics, Vietnam National University, Hanoi, 334 Nguyen Trai, Thanh Xuan, Hanoi, Viet Nam; Lab. de Magnét. de Bretagne, CNRS, B.P. 809, 29285 Brest Cedex, France; Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Mont-Saint-Aignam Cedex 76821, France

Abstract: X-ray diffraction, Mössbauer effect and magnetisation investigations have been performed on sputtered $Fe_{40}(Al_2O_3)_{60}$ thin films. Ultrafine Fe particles of nanometer size in an amorphous Al_2O_3 matrix have been formed by annealing in the temperature range from 100°C to 500°C. Their particle sizes, however, show a rather wide distribution. Mössbauer spectra are constituted of both paramagnetic and ferromagnetic contributions. The paramagnetic contribution is associated with small grains of Fe, whereas the magnetic component is contributed by large iron grains. This assumption is supported by the ZFC- and FC-measurements, in which the "blocking" temperatures of 60 and 90 K were evidenced for as-deposited and 200°C-annealed films, respectively.
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Correspondence Address: Fnidiki, A.; Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Mont-Saint-Aignam Cedex 76821, France; email: abdeslem.fnidiki@univ-rouen.fr
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- Fnidiki, A., Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France, Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Mont-Saint-Aignam Cedex 76821, France
- Dorien, C., Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France
- Richomme, F., Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France
- Teillet, J., Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France
- Lemarchand, D., Groupe de Physique des Materiaux, UMR CNRS 6634, Universite de Rouen, Site Universitaire du Madrillet, 76801 Saint-Etienne-Du-Rouvray Cedex, France
- Duc, N.H., Cryogenic Laboratory, Faculty of Physics, Vietnam National University, Hanoi, 334 Nguyen Trai, Thanh Xuan, Hanoi, Viet Nam
- Ben Youssef, J., Lab. de Magnét. de Bretagne, CNRS, B.P. 809, 29285 Brest Cedex, France
- Le Gall, H., Lab. de Magnét. de Bretagne, CNRS, B.P. 809, 29285 Brest Cedex, France

References:

- Xiao, J.Q., Jiang, J.S., Chien, C.L., (1992) Phys. Rev. Lett., 68, p. 3749
- Gittlement, J.L., Golstein, Y., Bozowsky, S., (1972) Phys. Rev., B5, p. 3605
- Chien, C.L., (1991) J. Appl. Phys., 69, p. 5276
- Chen, C., Kitakami, O., Shimada, Y., (1998) J. Appl. Phys., 84, p. 2184
- Chen, C., Kitakami, O., Shimada, Y., (1999) J. Appl. Phys., 86, p. 2161
- Duc, N.H., Huong Giang, D.T., Fnidiki, A., Teillet, J., (2003) J. Magn. Magn. Mater., 262, p. 420. , in this volume
- Kumar, D., Narayan, J., Kvit, A.V., Sharma, A.K., Sankar, J., (2001) J. Magn. Magn. Mater., 232, p. 161