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Surface anisotropy and orbital moment in Fe_3O_4 nanoparticles X. BATLLE, N. PEREZ, P. GUARDIA, O. IGLESIAS, A. LABARTA, IN2UB-U.Barcelona, A.G. ROCA, M.P. MORALES, C.J. SERNA, ICMM-CSIC, L.M. GARCIA, F. BARTOLOME, J. BARTOLOME, ICMA-CSIC and U. Zaragoza, J.C. CEZAR, ESRF-Grenoble — Fe_3O_4 nanoparticles (NP) in the 5-20 nm range were synthesised in the presence of a variety of surfactants (oleic acid, PVA, ...). Saturation magnetization M_s almost reaches the expected bulk value for those surfactants covalently bonded to the NP, being much larger than in those NP with just a protective coating. Thermo-remanence and ac susceptibility demonstrate that the surface anisotropy constant in covalently bonded NP is similar to the bulk value. XMCD confirms the dependence of the magnetic moment on the surface bond and suggests that the orbital contribution is smaller in covalently bonded NP. The occurrence of bulk M_s in Fe₃O₄ NP may thus be related to the crystal and magnetic state at the surface. This is of relevance in biomedical applications to reduce the strength of the magnetic field required to obtain a high magnetic response, while the issue of the orbital contribution in Fe_3O_4 is under hot debate. Work funded by Spanish NAN2004-08805-CO4-02, NAN2004-08805-CO4-01, MAT2006-03999, MAT2005-02454 and CONSOLIDER CSD2006-12, and Catalan 2005SGR0969.

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