Surface resonance modes in magnetic nanoparticles: size scaling of the frequency *versus* surface anisotropy.

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9.7 cm

Recent experiments[1] revealed intriguing particle size scaling laws in the resonance peak frequency dependence in CoNi nanoparticles. Scaling exponents have been determined from the slopes of the log-log plots of the resonance frequency *vs.* number of atomic shells in the particle. It has been established that the scaling exponent for the first resonance peak is always lower than 0.5, while those for the remaining ones vary around unity. Our theoretical analysis has led us to the conclusion that the exponent lower than unity in the size dependence of the first peak should be attributed to the surface mode only (on the other hand, the first peak exponent exceeding unity indicates univocally bulk nature of the respective mode). We therefore identify the first resonance peaks observed in the experiments[1] as being of a surface-localized nature. Its origin can be attributed either to the "easy-axis"-type uniaxial or unidirectional surface anisotropy. We have found that the value of the surface anisotropy increases with decreasing Co content in the investigated nanoparticles.

[1] D. Mercier, J.-C.S. Lévy, G. Viau, F. Fiévet-Vincent, F. Fiévet, P. Toneguzzo, O. Acher, "Magnetic resonance in spherical Co-Ni and Fe-Co-Ni particles", Phys. Rev. B 62 (2000) 532.

13.4 cm

Subject category :
2. Magnetic Films, Surfaces and Multilayers

Presentation mode :
oral

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