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Colossal reduction in Curie temperature due to finite-size effects in CoFe2O4 nanoparticles JAVIER TEJADA, VICTOR LOPEZ-DOMINGUEZ, JOAN MANEL HERNANDEZ, Dept. de Fisica Fonamental, Universitat de Barcelona, C. Marti i Franques 1, Barcelona 08028, Spain, RONALD F. ZIOLO, Centro de Investigación en Química Aplicada, Boulevard Enrique Reyna 140, Saltillo, 25253 México, GMAG TEAM, CIQA TEAM — In this talk I will show the tremendous size effect on the ordering transition temperature, T_O, in samples of $CoFe_2O_4$ nanoparticles with diameters ranging from 1 to 9 nm. Samples were characterized by HRTEM and XRD analyses and show a bimodal particle size distribution centered at 3 nm and around 6 nm for "small" and "large" particles, respectively. The results and their interpretation are derived from studies of the magnetization dependence of the samples on temperature at low and high magnetic fields and relaxation times using both DC and AC fields. The large particles show a typical superparamagnetic behavior with blocking temperatures, T_B, arround 100K and a Curie temperature, T_C, above room temperature. The small particles, however, show a colossal reduction of their magnetic ordering temperature and display paramagnetic behavior down to about 10K. At lower temperatures these small particles are blocked and show both exchange and anisotropy field values above 5T. The order of magnitude reduction in T_O demonstrates a heretofore unreported magnetic behavior for ultrasmall nanoparticles of $CoFe_2O_4$, suggesting its further study as an advanced material.

Javier Tejada
Dept. de Fisica Fonamental, Universitat de Barcelona,
C. Marti i Franques 1, Barcelona 08028, Spain

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