

# CORE/SHELL MAGNETIC (Fe,Co)-B NANOPARTICLES OF AMORPHOUS AND CRYSTALLINE STRUCTURE OBTAINED BY CHEMICAL REDUCTION

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Core/shell magnetic nanoparticles constitute a present topic of research of paramount importance [1]. This is supported by their possible application in nanoscale recording media and the intrinsic interest of breaking the superparamagnetic limit [1]. Most of the core/shell particles are of crystalline nature but recently we have shown that it is also feasible to produce pure M = Fe, Co-B amorphous alloys (M-B) or mixed (amorphous M-B + crystalline M) displaying such an arrangement [2, 3]. To produce them, we have followed a chemical reduction route involving an addition of NaBH<sub>4</sub> into an aqueous solution of SO<sub>4</sub>M salts, developed years ago [5, 6]. Special care was devoted to the drying process ensuring a fine ( $\approx 3$  nm) oxidized surface layer. We will give details of the structural arrangement in the 20 nm particles deduced from the data gathered by room-temperature EXAFS and XANES spectroscopies on the Fe and Co K-edges. For the pure M-B particles, a clear amorphous M-B core is observed, with  $R_{\text{Fe-Fe}} = 2.59(3)$  Å,  $R_{\text{Fe-B}} = 2.411(5)$  Å, and  $R_{\text{Co-Co}} = 2.54(5)$  Å and  $R_{\text{Co-B}} = 2.360(4)$  Å. The XANES data provided a direct evidence of poorly-crystallized MOOH crystals at the particle surface. In the case of the mixed structures, the EXAFS results confirmed the simultaneous existence of particles of either amorphous or Fe (or Co) crystalline cores. Hysteresis loops and AC-susceptibility (5-300 K) results are affected by an interfacial exchange pinning, and a simple model to explain the thermal variation of the coercivity will be discussed.

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