Magnetic Properties of Fe/Pt Nanoparticles Prepared in Imidazolium Ionic Liquids

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Abstract

The Fe/Pt bimetallic nanoparticles are very interesting for magnetic, optical, catalytic and biomedical applications. This work, we studied the magnetic properties of Fe/Pt nanoparticles prepared by the thermal decomposition of metallic precursors under H_2, atmosphere and ionic liquid (IL) media. The ionic liquids were washed out from all samples before characterization. Preliminary results of TEM images of Fe/Pt NPs show an average diameter of a 2 nm . The XRD patterns are typical of a chemically disordered fcc structure of Pt. The Fe (0) species are not observed by X-ray photoelectron spectroscopy (XPS) measurements, the formation of FePt alloys in the Fe/Pt NPs is excluded. We performed temperature and field dependent magnetization measurements on Fe/Pt. Zero Field Cooled (ZFC) temperature dependent magnetization curves display an interesting behavior, they show a maximum due to magnetic blocking and evidences of a second one at lower temperature (below 6 K). Furthermore, the irreversibility temperature is much higher than the maximum of the ZFC as expected due to interparticle magnetic interactions. These features also appear in AC susceptibility measurement with several frequencies. Two contributions to the magnetization are also observed on the field dependent magnetization curves as a sharp variation at low field (bellow 700 Oe) and a small slope with increasing field. These results suggest the existence of core@shell structure.