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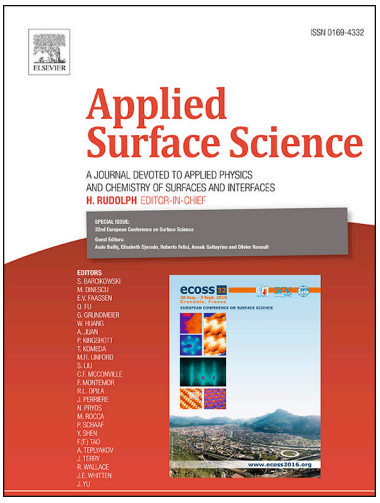

Full Length Article

Surface functionalization of Fe_3O_4@SiO_2 core-shell nanoparticles with vinylimidazole-rare earth complexes: synthesis, physico-chemical properties and protein interaction effects

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Surface functionalization of Fe_3O_4@SiO_2 core-shell nanoparticles with vinylimidazole-rare earth complexes: synthesis, physico-chemical properties and protein interaction effects

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Abstract

In search for magnetic nanoparticles with multifunctional complementary characteristics in this study, novel magnetite nanoparticles functionalized with vinylimidazole-rare earth complexes were analyzed. The morphology, size and structure of the obtained samples were determined by X-ray diffraction and scanning electron microscopy. Electron energy loss spectroscopy and X-ray photoelectron spectroscopy (XPS) analysis showed that the obtained nanoparticles consist of a crystalline magnetite core and a silica shell bearing on the outer surface functional groups of vinylimidazole. It was found that the rare earth complexed nanoparticles were superparamagnetic with saturation magnetization in the range 36.3-33.3emu/g. The surface interaction between the obtained nanosystems and bovine serum albumine (BSA) was investigated by Fourier Transform Infrared Spectroscopy (FTIR) with a special emphasis on the conformational changes of BSA induced by vinilimidazole-rare earth complexes. The results obtained from FTIR analysis showed the potential of these nanosystems to contribute to the process of α/β conversion of protein which highlights their applications in study of aspects regarding protein misfolding and aggregation.

Keywords: vinylimidazole, rare earth ions, magnetite nanoparticles, protein adsorption, XPS, FTIR