Particle & Particle Systems Characterization / Early View / 2200106

Research Article

Effect of Aminosilane Nanoparticle Coating on Structural and Magnetic Properties and Cell Viability in Human Cancer Cell Lines

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First published: 15 July 2022
https://doi.org/10.1002/ppsc.202200106

Abstract

Magnetic nanoparticle interfaces have aroused great scientific research interest in the biomedical area since the interaction of cells or biomolecules with nanoparticles is determined by the surface properties. Currently, in medical applications, there is a need to study cell interaction and growth, along with changes in structural or magnetic properties, attributed to nanoparticle coatings. In this study the coercive field changes in $Ni_xFe_{3-x}O_4$ nanoparticles (x = 0.0, 0.2, 0.4, 0.6, 0.8, and 1.0) driven by partial or total substitution of Fe^{2+} content by Ni^{2+}, and by aminosilane coating are evaluated. The nanoparticles are synthesized by the coprecipitation method. The inverse spinel structure is confirmed by X-ray diffraction results and Raman spectra. The aminosilane coating is confirmed by energy-dispersive X-ray spectroscopy and Fourier transform infrared spectroscopy. Dynamic light scattering confirms a mean hydrodynamic size of 10 nm. Scanning electron microscopy micrographs of the uncoated and aminosilane-coated samples show that the particles have a hemispherical shape. The coating increases the coercive field. In addition, uncoated $Ni_{0.2}Fe_{2.8}O_4$ has the highest viability in both MCF7 and HeLa cell lines, and aminosilane coating decreases cell viability. This study contributes to future applications of nanomedicine, such as hyperthermia and drug delivery.

Conflict of Interest

The authors declare no conflict of interest.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.