عنوان مقاله:

Surface Modification of Magnetic MnFe۲O۴@SiO۲ Core-shell Nanoparticles with deposited Layer of ۳-Aminopropyl Triethoxysilane

محل انتشار:

مجله علم مواد و مهندسی ایران, دوره 17, شماره 4 (سال: 1399)

تعداد صفحات اصل مقاله: 10

نویسندگان:

N. Akhlaghi - *Faculty of Chemical EngineeringBabol Noshirvani University of TechnologyBabol, Iran Post Code ۴۷۱۴۸-۷۱۱۶۷*

G. Najafpour - *Distinguished ProfessorFaculty of Chemical EngineeringBabol Noshirvani University of TechnologyBabol, Iran Post Code ۴۷۱۴۸-۷۱۱۶۷*

M. Mohammadi - *Faculty of Chemical EngineeringBabol Noshirvani University of TechnologyBabol, Iran Post Code ۴۷۱۴۸-۷۱۱۶۷*

خلاصه مقاله:

Modification of MnFe۲O۴@SiO۲ core-shell nanoparticles with (۳-aminopropyl) triethoxysilane (APTES) was investigated. The magnetite MnFe۲O۴ nanoparticles with an average size of ~۳۳ nm were synthesized through a simple co-precipitation method followed by coating with silica shell using tetraethoxysilane (TEOS); that has resulted in a high density of hydroxyl groups loaded on nanoparticles. The prepared MnFe۲O۴@SiO۲ nanoparticles were further functionalized with APTES via silanization reaction. For having suitable surface coverage of APTES, controlled hydrodynamic size of nanoparticles with a high density of amine groups on the outer surface, the APTES silanization reaction was investigated under different reaction temperatures and reaction times. Based on dynamic light scattering (DLS) and zeta potential results, the best conditions for the formation of APTES-functionalized MnFe۲O۴@SiO۲ nanoparticles were defined at a reaction temperature of ۷۰ °C and the reaction time of ۹۰ min. The effectiveness of our surface modification was established by X-ray photoelectron spectroscopy (XPS), transmission electron microscopy (TEM), Fourier transforms infrared spectroscopy (FTIR), and vibrating sample magnetometer (VSM). The prepared magnetite nanostructure can be utilized as precursors for synthesizing multilayered core-shell nanocomposite particles for numerous applications such as medical diagnostics, drug, and enzyme immobilization, as well as molecular and cell separation.

کلمات کلیدی:

Magnetite nanostructure, APTES, Magnetite nanostructure, MnFe۲O۴ core-shell nanoparticles, Silanization, Silica shell

لینک ثابت مقاله در پایگاه سیویلیکا: