QD10

Synthesis and Colloidal Stability of Core-Shell Structure of Magnetite Nanoparticles with Lecithin

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Nano-sized magnetic particles with tailored surface chemistry have been widely used experimentally for numerous in vivo applications such as hyperthermia, magnetic resonance imaging (MRI) contrast agent, immunoassay and cell separation, etc [1-5].

In this study, magnetite nanoparticles have been synthesized by thermal decomposition and adsorbed with lecithin as the surfactant by applying ultrasonic. The size and saturation magnetization changes of magnetic nanoparticles were observed with different lecithin concentration. The proper adsorption amount was observed in the lecithin concentration of 20 %(w/v). The saturation magnetization of the 13 nm magnetite with 20 %(w/v) lecithin was about 60 emu/g at room temperature, which is smaller than that of bulk magnetite due to surface effect. The adsorption amount of lecithin increased with the decrease of adsorption pH. Zeta potential was -9.83 mV for bare magnetite nanoparticles. However, it was shifted to lower value of -55.37 mV for lecithin-adsorbed magnetite nanoparticles. And, the adsorption on magnetite core with lower concentration of lecithin showed lower zeta potential. The surface modified magnetite nanoparticles with lecithin were found to be stabilized by steric and electrostatic repulsions.

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QD11

Doxorubicin-loaded Magnetite Nanoparticles for Application in Biomedicine: In Vivo Studies

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Much effort in research is directed toward finding less toxic and more efficient pharmaceutical formulations, especially for anticancer drug. Conjugating some drugs to colloidal carriers has been shown to favorably influence their efficacy and toxicity [1]. Doxorubicin (DOX), known for its cardiotoxicity, bone marrow and gastrointestinal toxicity [2,3] was shown to be less toxic when associated with nanoparticles [4]. The loaded drug on magnetic particles can be discharged from the body by the external magnetic field after treatment, which may solve the problem of chronic cardiotoxicity.

Magnetic nanoparticles with the homogeneous size, phase and dispersibility, and the biocompatibility were synthesized by thermal decomposition with ultrasonic, and then were surface-modified with DOXfor applying the anti-cancer therapy. The lecithin was selected as an interlayer between magnetic particle and DOX. The presence of DOX molecules controls the particle morphology and size of magnetite particles and their distribution by inhibiting growth. The presence of increasing concentration of DOX during adsorption process with ultrasonic exposure increases the particle size as well as narrows down the particles size distribution. Higher amount of DOX helps in obtaining larger and narrow size distribution of particles. Magnetic behavior is characteristic of superparamagnetic nature. These DOX-loaded magnetite particles are easily dispersed in PBS solution. Also, the effect of cancer therapy of DOX-loaded magnetite ferrofluids was estimated using Sprague-Dawley rats. As the concentration of DOX increased, the cytotoxicity of cancer cell increased. All these properties suggest that these surface-modified-magnetite nanoparticles with DOX may be suitable for anticancer therapy.

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