THE SYNTHESIS, SURFACE MODIFICATION AND STABILITY OF SPIO NANOPARTICLES FOR MRI APPLICATION

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Abstract

The biocompatibility and biodegradability of new magnetic resonance imaging (MRI) contrast agents is highly desired. The superparamagnetic iron oxide (SPIO) nanoparticles are suitable candidates for these purposes. Here the co-precipitation technique for synthesis of monodispersed SPIO nanoparticles is presented. The critical point of the synthesis is core formation and consequent crystal growth. The conditions for core formation (time, temperature, rate of base addition) were optimised.

The nanoparticles were stabilised by either silanisation or polymer coating (cationic chitosan, poly-D-Arg, dextran, gelatine, hyaluronic acid). The stability was investigated in physiological pH, different ionic strength solutions, PBS-albumine solution or blood plasma. The biocompatibility was tested in vitro either in the presence of Saccharomyces cerevisiae or erythrocytes suspension.

The size and shape was investigated by atomic force microscopy (AFM) and scanning electron microscopy (SEM). The molecular structures of nanoparticles were investigated by FTIR (Fourier transform infrared spectroscopy). The iron cations were determined using the Prussian blue staining test. The stability of nanoparticles was investigated by the dynamic light scattering (DLS).

Keywords: Superparamagnetic iron oxide (SPIO) nanoparticles, co-precipitation, magnetic resonance imaging (MRI), atomic force microscopy (AFM)

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