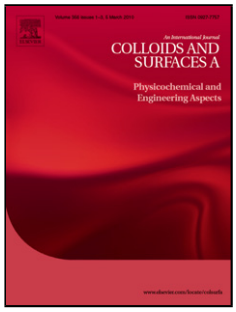

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Submicron Silica Shell–Magnetic core preparation and characterization

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Abstract

The magnetic extraction, purification, labeling and detection of biomolecules and cells are widely applied recently. In addition, the synthesis of silica magnetic particles for biomedical applications has been developed. In this paper, the synthesis of silica-coated magnetic nanoparticles was performed through three steps. First, an organic ferrofluid was prepared by the coprecipitation technique. Then it was used to prepare the magnetic emulsion. Finally, the hydrophobic magnetic nanoparticles were coated by silica shell using the sol-gel process. The prepared particles during the three steps were characterized in term of morphology, chemical composition and magnetic behavior under magnetic field. The results confirmed the formation of silica-coated magnetic nanoparticles, which are superparamagnetic even after silica encapsulation. The particles size was adjusted in order that a magnetic field can easily separate the particles at the same time they are stable colloids. Obtained particles can be used to extract and purified the nucleic acids, immobilized the enzymes, proteins and antibodies or to label the bacteria cells.

Keywords: silica shell; magnetic nanoparticle; silica; nanoparticle

1. Introduction

Over the last fifty years, magnetic colloids or ferrofluids attracted special attention for wide range of applications such as magnetic recording tapes, magnetic inks and paints, sealing for stationary shaft and more recently in biomedical fields [1-5]. In these applications iron oxide magnetic particles were used under the colloid form as separated nanoparticles with sizes of 5-20 nm, which is suitable for these applications. Otherwise, the magnetic-based separation techniques for biological materials request larger particles for fast and efficient separation [6-7]. The big magnetic particles can be separated easier and faster than the small ones so it is preferable to use the big particles. However, these particles have not a good colloidal stability and their specific surface area is smaller. Thus, the particles size should be carefully paid attention during the synthesis to balance between the separation speed and the colloidal