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Chitosan Magnetic Nanoparticles and Its Analytical Applications

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Abstract : Efficient extraction of proteins by removing interfering materials is necessary in proteomics, since most instruments cannot handle such contaminated sample matrices directly. In this study, chitosan-coated magnetic nanoparticles (CS-MNPs) for purification of myoglobin were successfully fabricated. First, chitosan (CS) was prepared by a deacetylation reaction during its extraction from shrimp-shell waste. Second, magnetic nanoparticles (MNPs) were synthesised, using the coprecipitation method, from aqueous Fe2+ and Fe3+ salt solutions by the addition of a base under an inert atmosphere, followed by modification of the surface of MNPs with chitosan. The morphology of the formed nanoparticles, which were about 23 nm in average diameter, was observed by transmission electron microscopy (TEM). In addition, nanoparticles were characterised using X-ray diffraction patterns (XRD), which showed the naked magnetic nanoparticles have a spinel structure and the surface modification did not result in phase change of the Fe3O4. The coating of MNPs was also demonstrated by scanning electron microscopy (SEM) analysis, energy dispersive analysis of X-ray spectroscopy (EDAX), and Fourier transform infrared (FT-IR) spectroscopy. The adsorption behaviour of MNPs and CS-MNPs towards myoglobin was investigated. It was found that the difference in adsorption capacity between MNPs and CS-MNPs was larger for CS-MNPs. This result makes CS-MNPs good adsorbents and attractive for using in protein extraction from biological samples.

Keywords : chitosan, magnetic nanoparticles, coprecipitation, adsorption
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