

Speciation, Preconcentration, and Determination of Iron(II) and (III) Using 1,10-Phenanthroline Immobilized on Alumina-Coated Magnetite Nanoparticles as a Solid Phase Extraction Sorbent in Pharmaceutical Products

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Abstract : The proposed method for speciation, preconcentration and determination of Fe(II) and Fe(III) in pharmaceutical products was developed using of alumina-coated magnetite nanoparticles ($\text{Fe}_3\text{O}_4/\text{Al}_2\text{O}_3$ NPs) as solid phase extraction (SPE) sorbent in magnetic mixed hemimicell solid phase extraction (MMHSPE) technique followed by flame atomic absorption spectrometry analysis. The procedure is based on complexation of Fe(II) with 1, 10-phenanthroline (OP) as complexing reagent for Fe(II) that immobilized on the modified $\text{Fe}_3\text{O}_4/\text{Al}_2\text{O}_3$ NPs. The extraction and concentration process for pharmaceutical sample was carried out in a single step by mixing the extraction solvent, magnetic adsorbents under ultrasonic action. Then, the adsorbents were isolated from the complicated matrix easily with an external magnetic field. Fe(III) ions determined after facility reduced to Fe(II) by added a proper reduction agent to sample solutions. Compared with traditional methods, the MMHSPE method simplified the operation procedure and reduced the analysis time. Various influencing parameters on the speciation and preconcentration of trace iron, such as pH, sample volume, amount of sorbent, type and concentration of eluent, were studied. Under the optimized operating conditions, the preconcentration factor of the modified nano magnetite for Fe(II) 167 sample was obtained. The detection limits and linear range of this method for iron were 1.0 and 9.0 - 175 ng.mL^{-1} , respectively. Also the relative standard deviation for five replicate determinations of 30.00 ng.mL^{-1} Fe²⁺ was 2.3%.

Keywords : Alumina-Coated magnetite nanoparticles, Magnetic Mixed Hemimicell Solid-Phase Extraction, Fe(II) and Fe(III), pharmaceutical sample

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