Speciation and preconcentration of iron by cloud point extraction combined with fiber optic linear array detection spectrophotometry

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A highly selective method for speciation and preconcentration of iron was developed using cloud point extraction (CPE) combined with fiber optic-linear array detection spectrophotometry (FO-LADS). Cloud point extraction method was based on the chromogenic reaction of Fe (II) and Fe (III) with 1-(2-pyridylazo)-2-naphthol (PAN) and then preconcentration of formed complexes using octylphenoxy polyethoxy ethanol (Triton X-114). When the system temperature is higher than the cloud point extraction temperature (CPT) of selected surfactant, the complex of Fe (II) with 1-(2-pyridylazo)-2-naphthol (PAN) could enter surfactant-rich phase, whereas the complex of Fe(III) remained in aqueous phase. Thus, an in situ separation of Fe (II) and Fe (III) could be realized. Iron complex in the surfactant-rich phase was determined by fiber optic-linear array detection spectrophotometry.

The main factors affecting the cloud point extraction, such as pH, concentration of (PAN) and Triton X-114, equilibration temperature and time, were investigated systematically. Under the optimized conditions, the enhancement factors of 167 and 158 were obtained for Fe (II) and Fe(III) respectively, the limits of detection (LOD) was 0.2 μgL^{-1} for Fe (II) and 0.5 μgL^{-1} for Fe(III). The relative standard deviations (n = 5, c = 40.0 µg/L) was lower than 3%. The proposed method is highly selective without any interference ions. This method was successfully applied to the speciation of iron in different samples with satisfactory results.

References

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