Utility of surfactant micelles for preconcentration and chemical speciation of metal-involving microcomponents in salt solution

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Summary

The project was undertaken to develop new approach to selective collection of metal ions and high efficient separation of metal complexes using surfactant micelles as essential media for these analytical procedures. Two model systems were investigated: (1) selective concentration of zinc ion from the solution containing high concentration of sodium ion onto silica gel with nonionic surfactant, (2) high efficient separation of algal chlorophylls by micellar electrokinetic chrom-atography (MEKC), that is a kind of electrophoresis using anionic surfactant.

Zinc ion at 10^{-5} M level in aqueous solution was extracted as neutral complex with 1-(2-pyridylazo)-2-naphthol in the micelles of nonionic surfactant, Triton X-100, dispersed in the solution. When small amount of silica gel was added to the solution, the micelles were adsorbed on the silica gel, and then zinc was quantitatively concentrated in the molecule assembly of the surfactant on the surface of silica gel. The surfactant and zinc complex were filtered or centrifuged with the silica gel as carrier. The zinc complex could be completely eluted from the silica gel with small amount of methanol.

The separation procedure is expected to be applicable to selective preconcentration and separation of various trace metal ions as well as zinc ion in the sample solution containing high concentration of alkali metal ions.

Chlorophylls, such as chlorophyll-a, -b, $-c_1$ and $-c_2$ were so much hydrophobic that MEKC could not be applied with popular pH buffered micellar solution of anionic surfactant, such as sodium dodecyl sulfate (SDS). In this study, the effects of organic additive to the running solution on the migration behavior of the chlorophylls was investigated . It was found that those four species of chlorophylls could be completely resolved in about 15 min when using pyridine as the organic additive to SDS micellar solution at pH 11. The MEKC condition is promising for chlorophyll analysis of marine algae and related samples.