

Redox-reaction Products of 4-sulfo-2-(4'-sulfonaphthalene-1'-azo) naphthol-1 with Ce(IV) - New Analytical Forms for its Quantitative Determination

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Received: August 17, 2018; Accepted: January 17, 2019

DOI: 10.17721/moca.2018.167-176

The results of redox interaction of Ce (IV) with 4-sulfo-2-(4'-sulfonaphthalene-1'-azo) naphthol-1 (carnosine-KAN) in aqueous solutions (pH 1.75) have been presented. The destructive oxidation of CAS into two fragments (2-nitroso-4-sulfonaphthol-1 (L^1) and 1-nitroso-4-sulfonaphthalene (L^2)) is accompanied by reduction of Ce(IV) to Ce(III). It was found that an increase in the $Ce^{(III)}-L^1-L^2$ system acidity to pH ~ 11 leads to formation of the $[Ce^{(III)}(OH)_2 \cdot L^1 \cdot 2H_2O]$ complex. After acetonitrile is introduced to $[Ce^{(III)}(OH)_2 \cdot L^1 \cdot 2H_2O] - L^2$ system (up to 40% by volume) self-organization of products involving CH_3CN is observed. The resulting water-acetonitrile system becomes turbid, and after ~10 min phase separation is observed. Phase I contains a solvate $\{L^2 \cdot (CH_3CN)_n\}$ of «straw» color (360 nm) and phase II (lower layer) contains solvated complex $\{[Ce^{(III)}(OH)_2 \cdot L^1 \cdot (CH_3CN)_2] \cdot (CH_3CN)_n\}$ of «blue» color (640 nm). The use of these solvates allows determination of Ce(IV) in the range $2.2 \div 50.1 \mu g/cm^3$ ($y = 0.5526c + 0.0575$, $R^2 = 0.9917$, $\epsilon_{360} = 6.2 \cdot 10^3$) and $4.2 \div 84.0 \mu g/cm^3$ ($y = 0.1862c + 0.0265$, $R^2 = 0.9952$, $\epsilon_{640} = 2.05 \cdot 10^3$), respectively. The revealed dependence was used for indirect (volumetric) determination of Ce(IV) ($y = -0.7857c + 20.4440$, $R^2 = 0.9988$). The methods was tested on standard samples of mineral origin and herbal pharmaceutical preparations.

Keywords: cerium, carnosine, oxidation-reduction, complexation, spectrophotometry, two-phase system, determination techniques