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Spectrophotometric and TRLFS speciation study of $UO_2(2+) - ChO_4(2-) - H_2O$ (Ch = S, Se) system

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This experimental study seeks for stability constants β_m° , absorption $Z_m(\lambda)$ and fluorescence $Z_m(\lambda)$ spectra (including fluorescence lifetimes τ_m) for the individual species of the general formula $[UO_2(ChO_4)_n]^{2-2n}$ ($n \in \{0; 1; 2; 3\}$), specific ion interaction theory parameters $\epsilon(i, j)$ between uranium-containing species and the most dominantly present ions (Na^+ , ClO_4^- , ChO_4^{2-} , $HChO_4^-$) and their temperature dependence (for which the ΔH° for all present complex species is derived).

Our study was done by preparing of several series of solutions (solutions differing by total sulfate/selenate concentration within the series and by total uranium concentration, pH and ionic strength between different series), measurement of the spectra (UV-VIS abs., TRLFS) and subsequent multilinear analysis (based on Singular Value Decomposition, Parallel Factor Analysis, ...).

The obtained results are compared with the previously measured data (our TRLFS spectra for uranyl-selenate complex species were, however, in the time of the abstract submission novel) and quantum chemical (ab initio and DFT) study, which part is presented on RadChem 2014 as well.

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