

Complexation of Uranium(VI) by Sulfur and Nitrogen Containing Model Ligands in Aqueous Solution.

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The long-term safety assessment of nuclear waste disposals requires detailed knowledge of the transport and interaction behavior of actinides within the technical, geotechnical and geological barriers. Humic substances, ubiquitous in natural environments, are able to influence the migration of actinides due to their ability for complex and colloid formation and their redox properties. It is known, that especially their carboxylic and phenolic OH groups are able to complex metal ions. In addition to these oxygen containing functional groups, humic substances also offer sulfur and nitrogen containing functionalities.

The aim of this work is to determine the influence of various sulfur and nitrogen containing functional groups on the uranium(VI) complexation and to evaluate their contribution in comparison to oxygen containing functional groups. For this, simple organic model ligands that can occur as building blocks for humic substances are used in the first instance with the objective to transfer the results to humic substances.

In this study, results are presented for the uranium(VI) complexation by the organic ligands benzenesulfonic and 4-hydroxybenzenesulfonic acid as well as for nicotinic and anthranilic acid. The complex formation constants for the uranium(VI) complexation were determined applying UV-vis absorption spectroscopy and time-resolved laser-induced fluorescence spectroscopy (TRLFS) as a function of pH.

For the uranium(VI) complexation by benzenesulfonic acid (BSA) and 4-hydroxybenzenesulfonic acid (HBSA) the formation of 1:1 complexes was detected. The stability constants for these complexes of the type $M_pH_qL_r$ were determined with $\log \beta_{101} = 4.4 \pm 0.4$ (BSA) and $\log \beta_{101} = 3.9 \pm 0.03$ (HBSA).