

## Radionuclide Complexation with Phthalate: First Results from Screening Experiments

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Large varieties of organic ligands are expected in repositories for the disposal of radioactive waste. Most of these ligands have an anthropogenic source (Intermediate Level Waste) and can potentially affect the solubility and chemical behavior (retention/migration) of the radionuclides disposed of in the geological repository. Phthalic acids are commonly used as plasticizers in polyvinyl chloride (PVC) and have applications as additives in some cement formulations. Some aqueous complexes of phthalate with lanthanides and actinides have been previously described in the literature, and thermodynamic data for binary complexes of the systems Ln(III)/An(III)-phthalate and U(VI)/Pu(VI)-phthalate are currently selected in the ThermoChimie database [1]. However, limited information is available for the complexation properties of phthalate in the hyperalkaline conditions of relevance in cementitious systems. Furthermore, no thermodynamic data is currently selected in ThermoChimie for the complexation of phthalate with tetra- and pentavalent actinides, i.e., An(IV) and An(V), relevant for repository conditions. In this context, the PhD thesis aims at investigating the complexation of phthalate with Ca(II), Nd(III)/Cm(III)/Eu(III), Th(IV)/Np(IV), Np(V) and U(VI) in alkaline to hyperalkaline pH conditions. As a first step, this present study focuses on phthalic acid, Na-phthalate and Nd(III)-phthalate systems.

A solubility study of phthalic acid and sodium phthalate was completed using UV-Vis spectroscopy, potentiometric titration, and TOC analysis. Nd(OH)<sub>3</sub>(s) was obtained by hydration of commercial Nd<sub>2</sub>O<sub>3</sub>(cr), as previously reported in the literature [2], and completion of the hydration reaction was ensured by X-ray diffraction. Undersaturation solubility experiments with Nd(OH)<sub>3</sub>(s) were performed under a wide range of pH ( $7 \leq \text{pH}_m \leq 13$ , with  $\text{pH}_m = -\log[\text{H}^+]$ ) and ligand concentrations ( $10^{-5} \text{ M} \leq [\text{Phthalate}]_{\text{tot}} \leq 0.05 \text{ M}$ ). First results from these screening

experiments will be presented in this contribution.

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References:

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