

LA-UR- 04 - 0584

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Title: Absorption Spectroscopic Studies of Neptunium(IV)
Complexes

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Submitted to: 227th ACS National Meeting
Anaheim, CA, March 28 - April 1, 2004



3 9338 00433 8587



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Form 836 (8/00)

Absorption Spectroscopic Studies of Np(IV) Complexes

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The complexation of neptunium (IV) with selected inorganic and organic ligands was studied as part of an investigation to establish key subsurface interactions between neptunium and biological systems. The prevalence of reducing environments in most subsurface migration scenarios, which are in many cases induced by biological activity, has increased the role and importance of Np(IV) as a key subsurface neptunium oxidation state.

The biodegradation of larger organics that often coexist with actinides in the subsurface leads to the formation of many organic acids as transient products that, by complexation, play a key role in defining the fate and speciation of neptunium in biologically active systems. These often compete with inorganic complexes e.g. hydrolysis and phosphate. Herein we report the results of a series of complexation studies based on new band formation of the characteristic 960 nm band for Np(IV). Formation constants for Np(IV) complexes with phosphate, hydrolysis, succinate, acetohydroxamic acid, and acetate were determined. These results show the 960 nm absorption band to be very amenable to these types of complexation studies.