

Actinide Separations Using *N*-Donor Compounds

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N-donor extractants preferentially extract An(III) over Eu(III). However, most only work from weakly acidic solutions. In contrast, BTPs (2,6-bis(5,6-dialkyl-1,2,4-triazin-3-yl)pyridines) extract from up to 1 M nitric acid with high selectivity. However, their selectivity is not understood on a molecular level. It is commonly assumed that *N*-donor ligands bond more covalently to An(III) than they do to Ln(III).

EXAFS investigations of An(III) (An = U, Pu, Am, Cm) and Ln(III) (Ln = Sm, Eu, Gd, Dy, Ho, Tm, Lu) complexes in organic solution demonstrate a slight structural difference between the An(III) and Ln(III) complexes: While Ln(III)-N bond lengths follow the lanthanide contraction, An(III)-N bond lengths are constant for all An(III) investigated.

TRLFS titrations in aqueous solution indicate significant differences in speciation: $[\text{Cm}(\text{BTP})_3]^{3+}$ forms at a much lower BTP concentration as does $[\text{Eu}(\text{BTP})_3]^{3+}$. The stability constants differ by > 2 orders of magnitude, in good agreement with BTP's selectivity in extraction experiments.

The fact that BTP maintain their selectivity in aqueous solution led to the development of a water soluble BTP. While common BTP are used as lipophilic extractants for An(III), the water soluble BTP is used as selective back-extraction agent for An(III).