

TRLFS, EXAFS and IR Studies on the Structural Determination of the Extracted Complexes of Ln(III) and An(III) with Cyanex301 and Cyanex302

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The structure of the extracted complexes of lanthanides, Ln(III) (Ln = Sm, Eu, Tb, Dy), and Cm(III) with Cyanex301 and Cyanex302 was investigated using Time-Resolved Laser-induced Fluorescence Spectroscopy (TRLFS), EXAFS and FT-IR spectroscopy. The results indicate that the composition of the extracted Ln(III)/Cyanex301 complexes is different from that of the An(III)/Cyanex301 complexes. Data suggest that the formula of the Ln(III) complexes is $\text{LnL}_3 \cdot 2\text{H}_2\text{O}$ or $\text{LnL}_4 \cdot \text{H}_2\text{O}$, where L stands for Cyanex301. However, the formula for the An(III)/Cyanex301 complexes is AnL_4 , with no H_2O but only 8 sulfur atoms from the 4 Cyanex301 ligands coordinated to An(III), suggested by the TRLFS data for Cm(III) and previous EXAFS and IR data for Am(III). In the case of Cyanex302 complexes, data indicate that there are 3 oxygen from 3 Cyanex302 and 3 to 5 H_2O coordinated to Ln(III) or An(III), suggesting that Cyanex302 is monodentate in the complexes and the molecular formula is $\text{ML}_3 \cdot n\text{H}_2\text{O}$ ($n=3-5$).