

Studies on the Thermodynamics of Ion-associated Extraction of ReO_4^- in Hydrochloric Acid Systems with TiOA

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This paper reported the thermodynamics of ion-associated extraction of ReO_4^- using tertiary amine TiOA as the extractant. In the system of TiOA, NH_4ReO_4 , $n\text{-C}_7\text{H}_{16}$, HCl, and H_2O , NH_4Cl was considered the supporting electrolyte. The concentration of ReO_4^- and the pH in the equilibrium aqueous phase were measured at ionic strengths from 0.2 to 2.0 $\text{mol}\cdot\text{kg}^{-1}$ and at temperatures from 278.15 to 303.15 K. The standard extraction constant K^0 of extraction action was obtained by extrapolation. The working equation was determined to be $\log K^0 = -8.944 + 3518.736/T + 0.0141T$, and the thermodynamic quantities for the extraction process were calculated.

This experiment confirmed that the process of ion-associated extraction of ReO_4^- in a hydrochloric acid system with TiOA is an exothermic reaction. $\Delta_r G_m^0$ and $\Delta_r H_m^0$ all increase with a decrease of temperature, while $\Delta_r S_m^0$ decreases with an increase of temperature. Thus, enthalpy is the motive force of the extraction reaction. This result will supply some basis for practical production.