



Solvent extraction of chromium(VI) from hydrochloric acid solution with trialkylamine/kerosene

Yingxue Li^a, Chongwei Cui^{a,b,*}, Xin Ren^a, Yan Li^a

^aSchool of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin, Heilongjiang, China

^bState Key Laboratory of Urban Water and Environment, Harbin Institute of Technology, Harbin, Heilongjiang, China

Tel. +18845181188; email: cuichongwei1991@126.com

Received 13 July 2013; Accepted 19 December 2013

ABSTRACT

The extraction equilibrium of Cr(VI) with trialkylamine (N235, R_3N , $R = C_8-C_{10}$) using kerosene as the diluent was investigated. The influence of various analytical parameters such as pH, equilibrium time, temperature, extractants, and diluents was systematically evaluated. The structure of organic solution was identified by Fourier transform infrared spectroscopy (FTIR). The results indicated that 99.99% Cr(VI) was extracted by N235 in kerosene under the optimum separation conditions. Results also observed that the relative affinities of different anions to N235 were in the order of $NO_3^- < PO_4^{3-} < SO_4^{2-} < Cl^-$. Thermodynamic functions revealed that the extraction process was exothermic in nature, and the enthalpy (ΔH) associated with the extraction process was calculated to be $-35.95 \text{ kJ mol}^{-1}$ at 298 K. Slope method analysis showed that the $\log D$ vs. $\log [N235]$ plots were straight lines with slope nearly 3.0 with kerosene, n-heptane, and n-dodecane as the diluents, but mole method analysis indicated that the molar ratio between N235 and hexavalent chromium ion in the extracted complex was identified to be 1. The loaded organic solvent was regenerated with NaOH, $NaNO_3$, $NaHCO_3$, and $N_2H_4 \cdot H_2SO_4$. The regenerated solvent could be reused in succeeding extraction of chromium(VI). FTIR confirmed that the structure of the loading organic solution can be destroyed in light.

Keywords: Solvent extraction; Hexavalent chromium; Trialkylamine; Photolysis

*Corresponding author.