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Selective Extraction and Separation of Titanium(IV) from Multivalent Metal Chloride Solutions Using 2-Ethylhexyl Phosphonic Acid Mono-2-ethylhexyl Ester

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Abstract

The extraction behavior of titanium(IV) from hydrochloric acid solutions was investigated using 2-ethylhexyl phosphonic acid mono-2-ethylhexyl ester (EHEHPA=HX) in kerosene as an extractant. The results demonstrate that the extraction of titanium(IV) follows the cation exchange mechanism:

$$TiO^{2+}_{aq} + 2(HX)_{2org} \Leftrightarrow TiO(HX_2)_{2org} + 2H^{+}_{aq}$$

where $(HX)_2$refers to the dimeric form of EHEHPA. The equilibrium constant of the extracted complex was deduced by nonlinear regression analysis by taking into account the aqueous phase complexation of metal ion with inorganic ligands and all plausible complexes extracted into the organic phase. The effect of the nature of diluent on the

extraction of titanium(IV) with EHEHPA was investigated and found that the extraction efficiency varies in the order: chloroform<benzene~toluene<xylene<kerosene. IR spectral studies of the extracted complex were used to further clarify the nature of extracted complex. The separation possibilities of titanium(IV) from other associated multivalent metal ions, that is, magnesium(II), aluminum(III), vanadium(V), chromium(III), manganese(II), and iron(III), which are associated with titanium in the waste chloride liquors of titanium minerals processing industry was discussed.

Keywords:

Selective extraction | Separation | Titanium(IV) | 2-Ethylhexyl phosphonic acid mono-2-ethylhexyl ester | Multivalent metal chlorides | Titania wastes

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