



Removal of chromium(III) from aqueous solutions using an advanced extraction technique (AET)

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ABSTRACT

The removal of chromium(III) from aqueous solution using an advanced extraction technique (AET) such as emulsion liquid membrane (ELM) was investigated. Tri-butyl phosphate (TBP) and tri-n-octylphosphine oxide (TOPO) as carriers, commercial kerosene as an organic solvent, sorbitan monooleate (Span 80) as hydrophobic surfactant agent, sodium hydroxide, and sulfuric acid or ammonium persulfate as a stripping phase were used. The influence of the carrier concentration (5–30% w/w), surfactant (2–8% w/w), and external phase (5–50 mg/L), contact time, internal phase type (H₂SO₄, (NH₄)₂S₂O₈ or NaOH), stirring speed (100–1200 rpm), W/O emulsion/external aqueous phase volume ratio (0.05–1) and the diluent type (hexane, heptane, and kerosene) on the extraction process was investigated. The obtained results showed that, at the optimum condition, practically all the chromium (III) ions were removed from the feed solution during the first 25 min of operational time. The best TBP/TOPO ratio in the organic phase that conducted to very good removal efficiency (≥99%) and excellent emulsion stability was 90/10% (w/w). The use of ultrasound irradiations in the emulsification step enhanced the emulsion stability. The US-ELM process appears to be a suitable alternative to develop a method for heavy metal ions removal from aqueous solution, and has been identified to give highest heavy metals recovery.

Keywords: Advanced extraction technique (AET); Emulsion liquid membrane (ELM); Chromium; Tri-butyl phosphate (TBP); Ultrasound

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