Desalination and Water Treatment
www.deswater.com
12 (2009) 45–51
January
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doi: 10.5004/dwt.2009.949

Uranium from phosphoric acid: Kinetic studies of the solvent extraction processes for uranium extraction

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Received 22 August 2008; Accepted in revised form 12 October 2009

ABSTRACT

Kinetics of the mass transfer processes involved in uranium recovery from wet process phosphoric acid (WPA) by solvent extraction employing synergistic extractants has been studied. In the present investigation results on the kinetics of separation of entrained solvent by diluent washing and uranium mass transfer behaviour have been discussed. Kinetic studies for the entrained solvent separation by diluent (petrofin) wash for D2EHPA/WPA system showed significant dependence of the rate constant value on the variables such as phase ratio, temperature and agitator speed. Kinetic studies on the mass transfer of U(VI) from phosphoric acid with 1.5 M D2EHPA+ 0.2 M TBP have been carried out using a constant interfacial area cell (Lewis cell). The effect of stirring speed, interfacial area, acidity of aqueous phase, extractant concentration in organic phase and temperature on the extraction rate constant indicate that both chemical reaction and diffusion, control the rate of uranium extraction from phosphoric acid to extractant phase. The activation energy for uranium mass transfer is found to be 18.1 kJ/mole. Experimental results showed that the rate of extraction has an inverse first order dependence on phosphoric acid concentration whereas the dependence of the rate constant on D2EHPA+TBP concentration was found to be greater than first order (1.5).

Keywords: Uranium; Kinetics; Lewis cell; Phosphoric acid

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Presented at the Symposium on Emerging Trends in Separation Science and Technology (SESTEC-2008)
March 12–14, 2008, University of Delhi, Delhi, India