Desalination and Water Treatment
www.deswater.com

38 (2012) 151–158
January

doi: 10/5004/dwt.2012.2739

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Effects of alkyl substituents of organophosphorous extractants on uranium permeation for recovery from uranyl nitrate raffinate

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Received 17 February 2011; Accepted 17 July 2011

ABSTRACT

Carrier mediated transport of uranium from nitric acid medium has been investigated using supported liquid membrane (SLM). Microporous polytetrafluoroethylene (PTFE) membrane (pore size : 0.45 μm, diameter : 47 mm, unless stated otherwise) was used as a solid support and various neutral donor organophosphorous extractants like tributyl phosphate (TBP), tris (2-butoxyethyl) phosphate (TBEP), and tris(2-ethylhexyl) phosphate (TEHP) dissolved in *n*-paraffin (a mixture of C_{12}-C_{14}) were used as carriers. Effects of various parameters like feed acidity, carrier concentration, uranium concentration, pore size, and membrane thickness on transport of uranium were investigated. Uranium transport with different carrier solutions followed the order: TEHP ≥ TBP > TBEP. Transport of uranium increased with feed acidity and reached a maximum at 3.3 M HNO_3 and decreased thereafter with increased nitric acid concentration. The permeation of uranium across SLM increased with increased membrane pore size and decreased with increased membrane thickness. These extractants were also evaluated for uranium recovery from uranyl nitrate raffinate (UNR) waste. TEHP appeared promising for efficient and selective extraction of uranium from such waste solutions.

Keywords: Supported liquid membrane; Organophosphorous extractant; Uranium; Transport

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Proceedings of DAE-BRNS Biennial Symposium on Emerging Trends in Separation Science and Technology, Kalpakkam, India, March 1–4, 2010