Desalination and Water Treatment
www.deswater.com
12 (2009) 68–72
January
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doi: 10.5004/dwt.2009.960

Third-phase formation in the extraction of thorium nitrate by *N,N*-dihexyloctanamide

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Received 9 March 2009; Accepted in revised form 22 October 2009

ABSTRACT

N,N-dihexyloctanamide (DHOA) is an alternative candidate to tri-*n*-butylphosphate (TBP) for the reprocessing of spent nuclear fuels including those based on thorium. This paper reports the third-phase formation behavior of Th(IV) with varying phase modifiers, diluents, extractant/nitrate ion concentration and temperature using DHOA/*n*-dodecane as solvent. The Th(IV)-LOC (limiting organic concentration) values increased with increasing concentration of the alcohols (modifiers) and that of DHOA in the organic phase. No third phase was observed when diethyl benzene (DEB) and decahydronaphthalene (decalin) were used as diluents. There was a sharp increase in Th(IV)-LOC value from 39.6 g/L (1 M HNO_3) to 48.6 g/L (1 M HNO_3 + 1 M $NaNO_3$) beyond which a saturation behavior was observed for Th(IV)-DHOA/*n*-dodecane system. The Th(IV)–LOC values increased with temperature but decreased with the aqueous phase acidity.

Keywords: Thorium; Third-phase; Amide; TBP; Diluent; Phase modifier; Temperature

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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