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# The Solvent Extraction of Uranium, Plutonium and Thorium from Aqueous Solution by 1-Hydroxyhexadecylidene-1,1-Diphosphonic Acid

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**Abstract :** In this paper, the solvent extraction of uranium(VI), plutonium(IV) and thorium(IV) from aqueous solutions using 1-hydroxyhexadecylidene-1,1-diphosphonic acid (HHDPA) in treated kerosene has been investigated. The HHDPA was previously synthesized and characterized by FT-IR, 1H NMR, 31P NMR spectroscopy and elemental analysis. The effects contact time, initial pH, initial metal concentration, aqueous/organic phase ratio, extractant concentration and temperature on the extraction process have been studied. An empirical modelling was performed by using a 25 full factorial design, and regression equation for extraction metals was determined from the data. The conventional log-log analysis of the extraction data reveals that ratios of extractant to extracted U(VI), Pu(IV) and Th(IV) are 1:1, 1:2 and 1:2, respectively. Thermodynamic parameters showed that the extraction process was exothermic heat and spontaneous. The obtained optimal parameters were applied to real effluents containing uranium(VI), plutonium(IV) and thorium(IV) ions.

**Keywords :** solvent extraction, uranium, plutonium, thorium, 1-hydroxyhexadecylidene-1-1-diphosphonic acid, aqueous solution
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