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Comparative studies on the determination of di-*n*-butyl phosphate in degraded solvent of PUREX process by ion chromatography and gas chromatography methods

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ABSTRACT

This paper describes comparative studies on the determination of di-*n*-butyl phosphate (DBP) by ion chromatography (IC) and gas chromatography (GC) techniques in spent solvent of PUREX process used for the reprocessing of spent nuclear fuels. The ion chromatography method involves the separation of DBP from 30% TBP–NPH (tri-*n*-butylphosphate diluted in normal paraffin hydrocarbon) containing heavy metal ion like uranium and nitric acid by extraction of DBP into alkaline medium. DBP was subsequently eluted by ion-exchange separation in ion chromatography column and followed by suppressed conductivity detection. DBP is quantified to a lower limit of about 1 ppm with 3% RSD. However, in order to determine DBP by gas chromatography technique DBP is first quantitatively converted into its volatile and stable derivatives by using diazomethane prior to analysis by GC. Results obtained with ion chromatographic technique are compared with those of obtained by standard gas chromatographic technique. It was observed that IC technique involves minimum steps and is much faster than GC analysis. The effect of mobile phase flow rate on the detector response, retention time, and column pressure are also investigated.

Keywords: Di-*n*-butyl phosphate; Ion chromatography; Gas chromatography; Suppressed conductivity; Flame ionization detector; Diazomethane; PUREX process

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