



## Removal of dissolved Tri *n*-butyl phosphate from aqueous streams of reprocessing origin: engineering scale studies

Smitha Manohar<sup>a,\*</sup>, K. Narayan Kutty<sup>a</sup>, Bharat Vallabhdas Shah<sup>a</sup>, Piaray Kishen Wattal<sup>a</sup>, Shaila Lalkuwar Bajoria<sup>b</sup>, Nitin Sopan Kolhe<sup>b</sup>, Virendra Kisan Rathod<sup>b</sup>

<sup>a</sup>BETDD, NRG, BARC Trombay, Mumbai 400085, India

Tel. +91 (022) 25591083; email: smanohar@barc.gov.in

<sup>b</sup>Department of Chemical and Engineering, Institute of Chemical Technology, Mumbai 400019, India

Received 17 February 2011; Accepted 21 July 2011

---

### ABSTRACT

Tri-*n*-butyl phosphate is extensively used in aqueous reprocessing of spent nuclear fuel for separating the fissile elements from fission products and other wastes. Presence of tri-*n*-butyl phosphate in these acidic aqueous solutions leads to a limitation with respect to evaporation of these streams for achieving volume reduction. Process development for removal of dissolved tri-*n*-butyl phosphate from acidic solutions has been addressed in the present work using solvent extraction route. Batch studies were followed with continuous runs using Combined Air-lift based Mixer-Settler Unit (CAL-MSU). These studies have revealed that the dissolved TBP in aqueous solutions can be brought down from 160 ppm to 15 ppm using dodecane with a maximum loading of 3.6% TBP. All these studies on CAL-MSU have demonstrated the applicability of diluent in removing dissolved TBP from reprocessing aqueous solutions. The results obtained reveal an alternate method for stripping out dissolved TBP from reprocessing solutions thereby achieving higher volume reduction factors during evaporation by avoiding the "Red oil" formation.

*Keywords:* TBP removal; nitric acid; CAL-MSU; *n*-dodecane; solvent extraction; red oil formation

---

---

\*Corresponding author.