



## Studies on the use of octyl (phenyl) phosphinic acid (OPPA) for extraction of yttrium (III) from chloride medium

Mallavarapu Anitha<sup>a</sup>, Dhruva Kumar Singh<sup>a</sup>, Ritesh Ruhela<sup>b</sup>, Jyotinath Sharma<sup>b</sup>, Harvinderpal Singh<sup>a,\*</sup>

<sup>a</sup>Rare Earths Development Section, Bhabha Atomic Research Centre, Mumbai 400085, India

Tel. +91 (22) 25594949; Fax: +91 (22) 25505151; email: [hsingh@barc.gov.in](mailto:hsingh@barc.gov.in)

<sup>b</sup>Hydrometallurgy Section, Bhabha Atomic Research Centre, Mumbai 400085, India

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### ABSTRACT

Extraction behaviour of Y(III) from hydrochloric acid medium by octyl phenyl phosphinic acid (OPPA) has been investigated over a wide range of experimental conditions such as feed acidity, yttrium concentration, OPPA concentration, diluents, temperature, stripping reagents. The extraction mechanism of Y(III) with OPPA was established using distribution data obtained by slope analysis technique and it showed the formation of  $Y(HA_2)_3$  type of neutral species in the organic phase. This was also confirmed by non-linear least square regression of the distribution data to the mathematical expression correlating percentage extraction and acidity. The extraction constant ( $\log K_{ex}$ ) of the two phase reaction has been evaluated to be 3.2. Distribution ratio ( $D$ ) decreased with the increase in temperature with  $\Delta H = -16$  kJ/mole. Amongst the reagents studied, 7 M  $H_2SO_4$  was found to be better with 70% stripping of Y(III) in a single contact. Extraction of Y(III) in different diluents followed the order: dodecane > dichlorobenzene > xylene > chlorobenzene. A mathematical model  $D = (183.69 \pm 7.24)/(0.5)^{0.59*} (H_i)^3$  was proposed to predict the concentration of yttrium in organic as well as in aqueous phases at any initial concentration of yttrium  $[C_i]$  and initial hydrogen ion concentration  $[H_i]$ . In addition, the extraction efficiency for other rare earths by OPPA was also investigated and followed the trend: La < Ce < Pr < Nd < Sm < Eu < Gd < Tb < Dy < Ho < Er < Tm < Yb < Lu, which raised with increasing atomic number of elements. Separation factors between adjacent rare earths were also evaluated for OPPA system.

*Keywords:* Solvent extraction; Rare earths; Yttrium; OPPA; Separation factors; Extraction constant ( $K_{ex}$ )

\*Corresponding author.