

(18.13) In a solvent extraction system consisting of uranium and lanthanum in 1 M HNO₃ and 100% TBP, $D_U=20$ and $D_{La}=0.07$. If a phase ratio $\theta=V_{org}/V_{aq}=0.5$ is chosen, how much uranium is removed from the aqueous phase in three repeated extractions? How much of the lanthanum is coextracted? The fraction extracted with n fresh organic volumes (V_{org}) from one aqueous volume (V_{aq}) is:

$$E_n = 1 - (1 + D^* \theta)^{-n}$$

Given data:

$$D_U := 20 \quad D_{La} := 0.07 \quad \theta := 0.5$$

Calculations:

$$E_{3U} := 1 - \frac{1}{(1 + D_U \theta)^3} \quad E_{3La} := 1 - \frac{1}{(1 + D_{La} \theta)^3} \quad \text{From eqn.(A.6) on p. 673, but also given in the text.}$$

$$E_{3U} = 0.999 \quad E_{3La} = 0.098 \quad \text{Hence:} \quad E_{3U} = 99.925 \cdot \% \quad E_{3La} = 9.806 \cdot \%$$

99.9% of uranium is extracted and 9.8% of La is coextracted