

Short Communications

The adsorption of yttrium, neodymium and lanthanum on a strong base anion exchange resin from dilute hydrochloric acid solutions containing ethanol

In a previous paper¹, the adsorption and resolution of Y, Nd and La by a strong base anion exchange resin from dilute nitric acid solutions containing ethanol was described. The present communication reports the adsorption of Y, Nd and La on a strong base anion exchanger from dilute hydrochloric acid solutions containing ethanol. Rare earths are not adsorbed by strong base anion exchange resins at any concentration of hydrochloric acid solution^{2,3}. Hydrochloric acid-ethanol mixtures have been used by LEDERER⁴ for the paper chromatographic separation of rare earths.

14 × 1.4 cm columns of Amberlite IRA CG-400, 2-4X, 100-200 mesh, chloride form resin have been used in this work. A mixture of specpure rare earth chlorides equivalent to 1 mg each of Y, Nd and La dissolved in 5 ml HCl-ethanol of the same concentration as to be used as eluant was applied to the top of the resin bed and soaked into the resin at a flow rate of 1 ml/min. The column had previously been equilibrated with 100 ml of the HCl-ethanol mixture to be used as eluant.

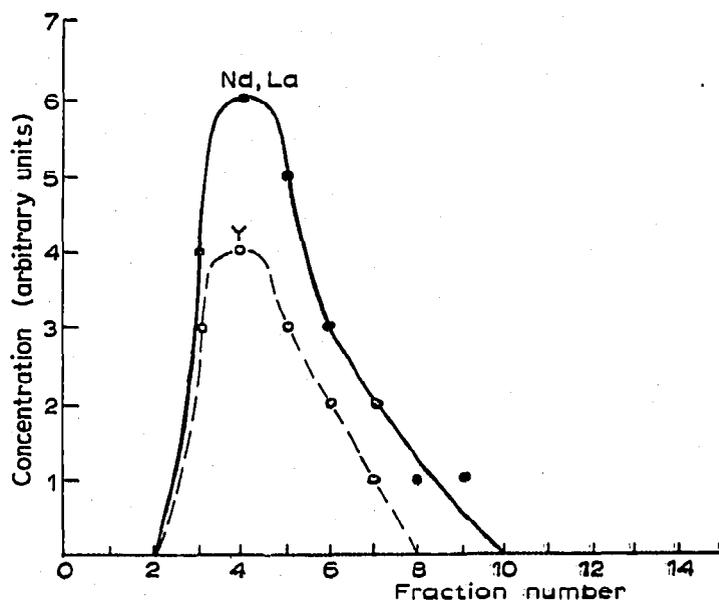


Fig. 1. The elution of Y, Nd and La from a 14 × 1.4 cm column of Amberlite IRA CG-400, 2-4X, 100-200 mesh resin with 1 N HCl-80% ethanol. Flow rate, 1 ml/minute. Volume/fraction, 15 ml. Note: Since Nd and La had very similar relative intensities, their elution has been shown by means of a single curve.

The following eluant systems were investigated:

- (i) 1 N HCl and varying concentrations of ethanol (0, 50 and 80 % ethanol).
- (ii) 80 % ethanol and varying concentrations of HCl (0.1, 1.0 and 2.0 N HCl).

Elution was carried out at room temperature, a flow rate of 1 ml/min being employed. The effluent was collected in 15 ml fractions. Each fraction was taken to dryness and arced to completion at 4.5 A DC. Semiquantitative elution curves were constructed by plotting rare earth relative intensities against the effluent volume. (For details of the spectographic monitoring of the effluent fractions and the construction of semiquantitative elution curves, see EDGE¹).

A typical semiquantitative elution curve is shown in Fig. 1.

From the elution curves obtained, the volume distribution coefficients (D_v) were evaluated from the familiar relationship

$$D_v = V_{\max} - i$$

where V_{\max} is the number of column volumes of effluent at which an element appeared in maximum concentration and i is the fractional interstitial volume (ca. 0.4).

D_v values, estimated to within $\pm 30\%$, are shown in Table I.

TABLE I

Eluant	D_v (Y, La, Nd)
1 N HCl	0.3
1 N HCl-50 % ethanol	0.6
1 N HCl-80 % ethanol	2.4
0.1 N HCl-80 % ethanol	1.0
1 N HCl-80 % ethanol	2.4
2 N HCl-80 % ethanol	3.1

From Table I it is seen that rare earths showed increased adsorption by the resin with increasing ethanol and HCl concentrations.

Y, Nd and La were found to be unresolved by all the HCl-ethanol eluant systems employed.

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