PRODUCT SHEET

RE resin

Main Applications

- Separation of rare earth elements (REE)
- Separation of actinides

Packing

Order N°.	Form	Particle size
RE-B25-A, RE-B50-A, RE-B100-A, RE-B200-A	25g, 50g, 100g and 200g bottles RE resin	100-150 µm
RE-C20-A, RE-C50-A	20 and 50 2 mL RE resin columns	100-150 µm
RE-B10-S, RE-B25-S, RE-B50-S	10g, 25g and 50g RE resin bottles	50-100 µm
RE-R50-S	50 2ml cartridges RE resin	50-100 µm
RE-B10-F	10g bottles RE resin	20-50 µm

Physical and chemical properties

Density : 0.37 g/ml
Capacity : 8 mg Y/g resin RE
12 mg Nd/g resin RE

Conversion factor D_W/k' : 1,85

Conditions of utilization

Recommended T of utilization : /
Flow rate: A grade: 0.6 – 0.8 mL/min, utilization with vacuum or with pressure for s grade resin
Storage: Dry and dark, T<30°C

For additional information see enclosed literature study

RE RESIN

The RE (Rare Earth) resin is mainly used for the group separation and determination of Rare Earth Elements (REE), especially of the heavy REEs. It is thus complementary to the LN resin which finds use in the separation of the lanthanides and radium (see also TKI N°1).
The RE resin, like the TRU resin, is composed of CMPO (octyl(phenyl)-N,N-diisobutylcarbamoyl-methylphosphine oxide) dissolved in TBP (tributyl phosphate) and impregnated onto an inert support. In case of the RE resin the proportion of CMPO used is higher than for the TRU resin, with the aim of increasing its affinity for the REEs.
Huff and Huff (1) performed an extensive study on the retention of selected lanthanides and some other elements frequently found in samples from nitric and hydrochloric acid on RE and TRU resin (fig. 1 – 3).

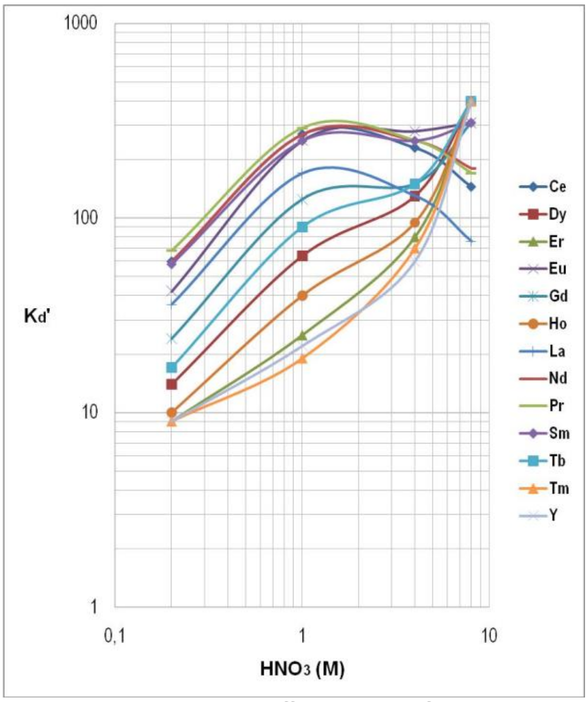


Figure 1 : *Distribution coefficients Kd' of lanthanides on RE Resin (1).*

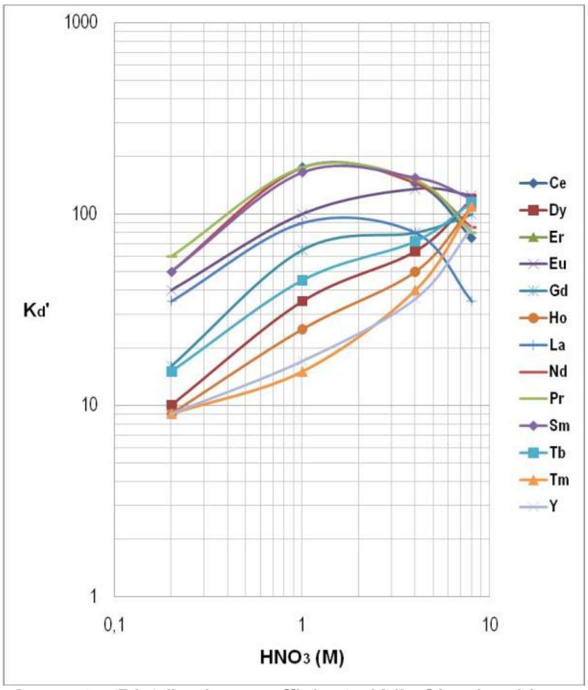


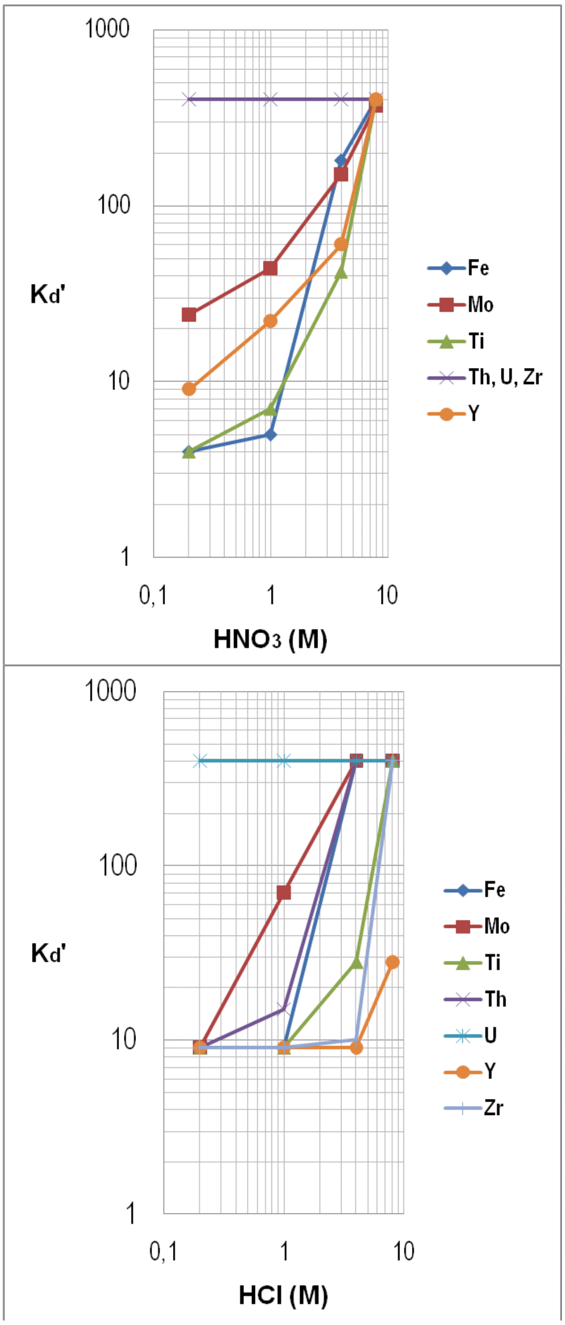
Figure 2 : *Distribution coefficients Kd' of lanthanides on TRU Resin (1).*

Figures 3a) and 3b) compare the affinity of some elements to both resins in HNO_3 and HCl.

Iron is showing increasing retention with increasing acid concentration. In general the retention is stronger from nitric acid than from hydrochloric acid, only exceptions are molybdenum and tin. The tables also show that all elements are more strongly or at least similarly well retained on the RE resin compared to the TRU resin.

Esser et al. (2) have been using the RE resin for the separation and purification of lanthanides from natural water samples (well water, source water, sea water) before their measurement by ID-ICPMS. The lanthanides were concentrated using 2mL of a silicate impregnated with 8-Hydroxyquinoline before being purified using 100µL of RE resin. In the first step (concentration) 1L of the water sample was used; the lanthanides were finally eluted from the RE resin using a volume of 1mL, resulting in an overall 1000-fold concentration.

Beside for the REEs the RE resin also shows a strong affinity for yttrium. This fact lead Dietz and Horwitz to evaluating the use of the RE resin for the production of Y-90 for radiopharmaceutical purposes (3).The solution containing Sr-90 / Y-90 was passed several times through SR resin, the respective first fractions (load and rinse solutions) which contain the Y-90 were collected and unified. This unified solution was filtered, evaporated and redissolved in 2M HNO_3 before being passed over the RE resin. The yttrium is retained on the RE resin and can finally be eluted e.g. in a small volume of dilute hydrochloric acid. Following Huff et al. Y can also be retained on the RE Resin from 3M HNO_3 and subsequently eluted using 8M HCl, under these conditions Zr-90, stable daughter of Y-90, remains on the column.



Figures 3a and 3b : *Distribution coefficients Kd' of various elements in a) HNO_3 and b) HCl media (1).*

The affinity of various elements for the RE resin at 2M HNO_3 is shown in table 1 and figure 4. One of the principal interferents of yttrium is iron.

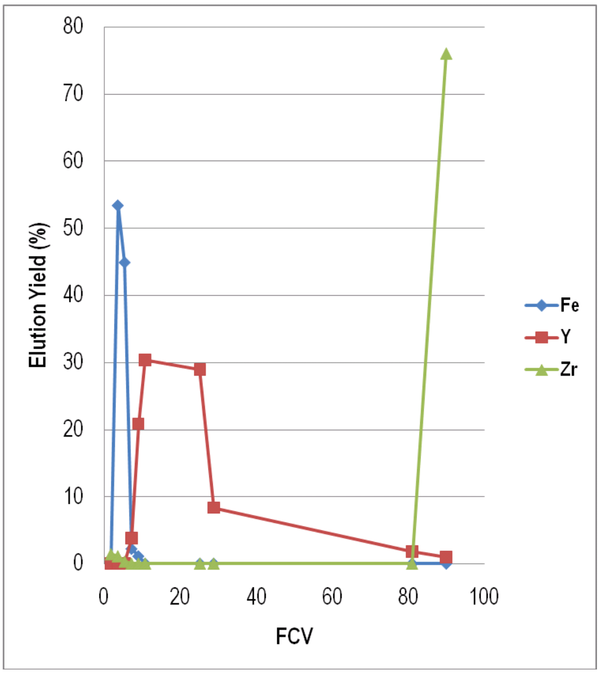


Figure 4 : *Elution curves of Fe, Y and Zr (3).*

Element	2M HNO_3									0.05M HNO_3
	1,8*	3,6*	5,4*	7,2*	9*	10,8*	25,2*	28,8*	81*	90*
Ag	82	17.9								
Al	79.4	26.8								
Ba	79.9	27.2								
Bi										7.8
Ca	75.3	33.7								
Cd	72.6	34.2								
Co	75	30.3								
Cs	74.8	27								
Cu	76.4	30.1								
Fe	<0.5	53.4	44.9	2.2	<1.1					
Hg	47.5	51.2								
K	81.8	27.3								
Li	79.7	27.8								
Mg	78.5	28.3								
Mn	45.8	61.2								
Na	74.7	30.5								
Ni	77.3	28.2								
Pb	63	41.9								
Rb	75.9	27.2								
Sr	78.8	28.9								
Y				3.8	20.8	30.3	28.9	8.3	1.8	<1.0
Zn	77.2	30.2								
Zr	1.4	1.1	0.3							76

Table 1 : *Retention/elution of different elements on RE resin. The eluted quantity of the element in each fraction is expressed in % of the originally introduced quantity (* - Fractions are expressed in FCV – Free Column Volume) (3).*

The decontamination factors obtained on RE resin are summarized in table 2. With respect to the high activities involved, the radiolysis stability of the resin was tested by determining the weight distribution ratios for Am of the resin after absorption of varying doses (table 3). It seems that the Am retention on RE resin is only very little effected by the absorbed doses, with Dw(0) = 287 and Dw(80) = 253. The authors could obtain, by combining SR and RE resin, overall Sr-90 decontamination factors in the Y-90 fraction of nearly 10E+09.

Element	Decontamination factor
Ag	>1390
Al	>70
Ba	>350
Bi	>220
Ca	>600
Cd	>2970
Co	>770
Cs	>1000
Cu	>1700
Fe	180
Hg	(>20)
K	(>10)
Li	>48
Mg	>360
Mn	>2500
Na	>79
Ni	>770
Pb	>370
Rb	>580
Sr	>3900
Zn	>1740
Zr	>1800

***Table 2** : Decontamination factors for different elements on RE resin (3).*

Absorbed dose (Wh/L)	Dw – 0.05M HNO_3	Dw - 2M HNO_3
0	8.38	287
10	6.32	260
20	6.37	265
40	7.57	258
80	9.47	253

***Table 3** : Weight distribution ratios Dw of Am on RE resin. Conditions: approx. 100mg of resin, $Dw = V_{aq}(A_0-A_s)/(m.A_s)$ – V_{aq} :volume of the aqueous phase, m :mass of resin, A_0 and A_s : respective activities in the aqueous phase before and after extraction (3).*

Bibliography

(1) Huff E.A., Huff D.R., *34th ORNL/DOE Conference on Analytical Chemistry in Energy Technology*, Gatlinburg-TN, USA (1993)

(2) Esser B.K. et al., *Anal. Chem.*, Vol.66, 1736 (1994)

(3) Dietz M., Horwitz E.P., *Applied Rad. Isot.*, Vol.43, 1093 (1992)