RADIOCHEMISTRY

RE Resin

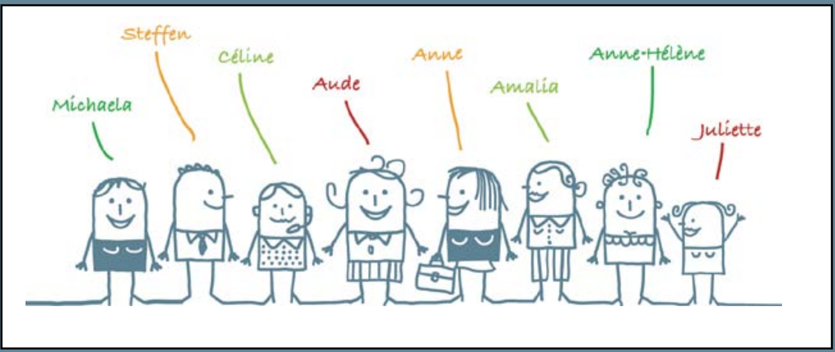
The RE (Rare Earth) resin is mainly used for the separation and determination of Rare Earth Elements (REE), especially of the heavy REEs. It is thus complementary to the LN resin which finds use in the separation of the light REEs and radium (see also TKI N°1).

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). 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.

(NEXT) PAGE 2

Please note that TrisKem will be closed from evening of 23 December to the morning of 5 January.



We are glad to have you among our customers and wish you a merry Christmas, a good start into the New Year and a happy and successful year 2009!

EDITORIAL

As the year 2008 draws to a close we would like to take the opportunity to thank you for your loyalty and trust. Since our independence in 2007 we have implemented all means to provide you with quality products and to support your analytical problems. You have probably received our first customer satisfaction survey and we thank you in advance for being so kind as to participate to it. Thanks to your answers we will be able to improve our services and products.

This 2008 last issue presents you the characteristics and properties of the RE resin. We are increasingly receiving requests concerning this resin, so it seemed logical to dedicate this last issue to its capacities.

TrisKem International will be present in different conferences and workshops in 2009. You will find the details of these conferences page 4.

Aude Bombard
Product Manager

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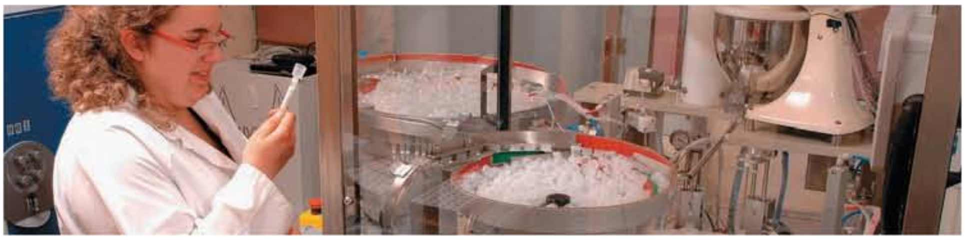
Quality Control of the resins

All our resins undergo at least one quality control. Bulk resin is tested in batch after each lot production. The qualified lot is used either for bottle or column packing. The resin packed in column is again qualified. Starting in January 2009, quality control on bulk resin assigned to bottle packaging will be done on column of bulk resin and no longer on batch mode. This will allow us to get a quality control closer to your uses and to get finer acceptance criteria.



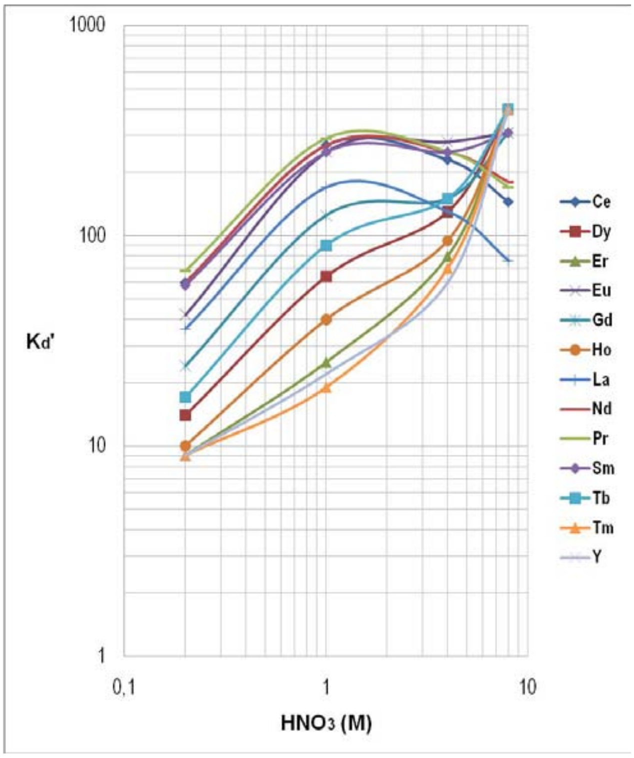


Figure 1 : *Distribution coefficients Kd' of lanthanides on TRU Resin (1).*

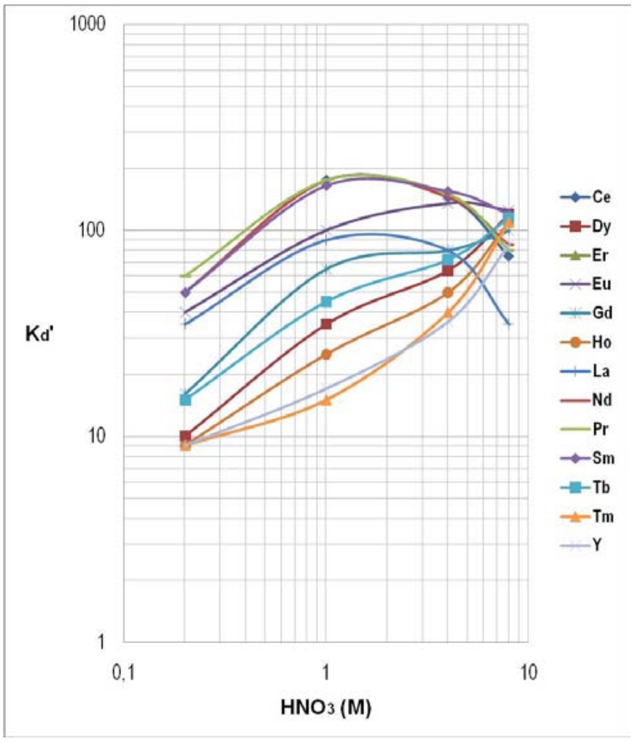
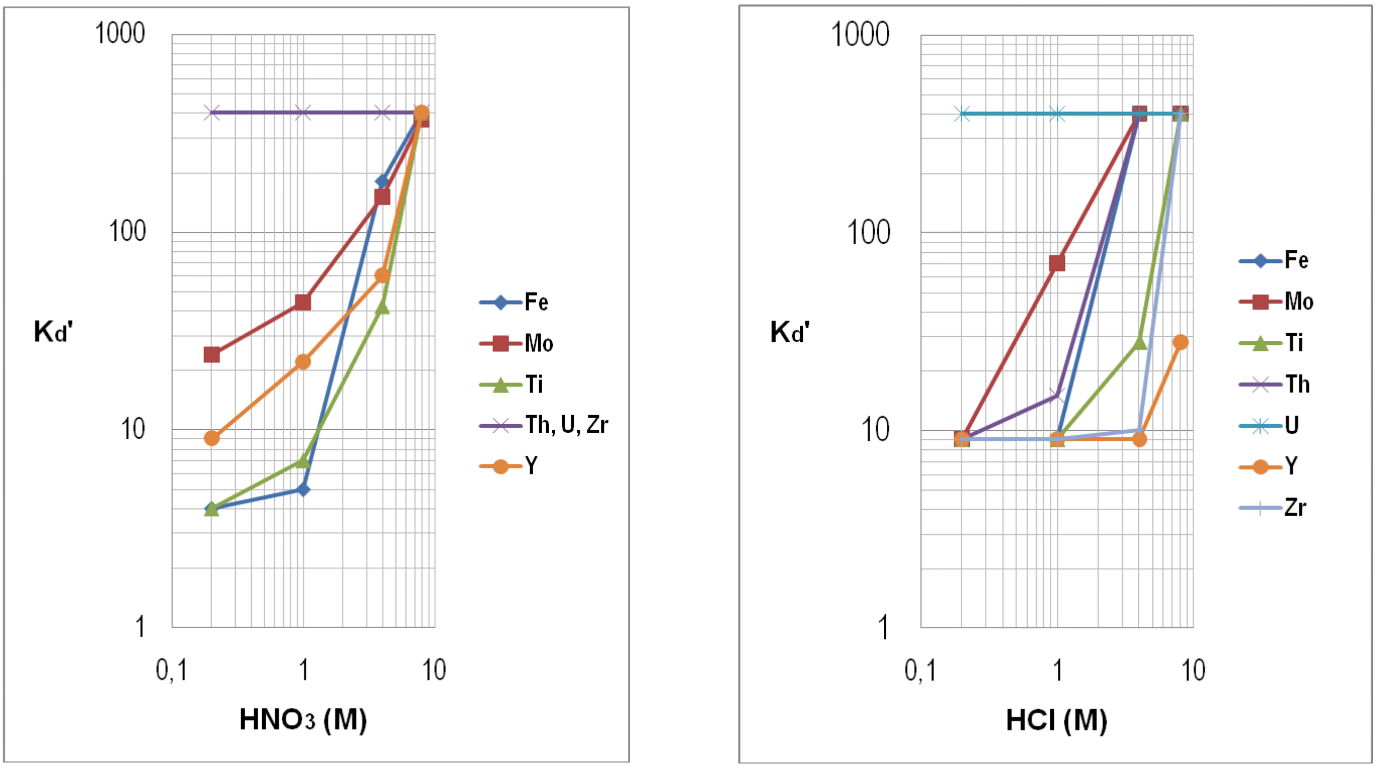


Figure 2 : *Distribution coefficients Kd' of lanthanides on TRU Resin (1).*

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 HNO3 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.



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

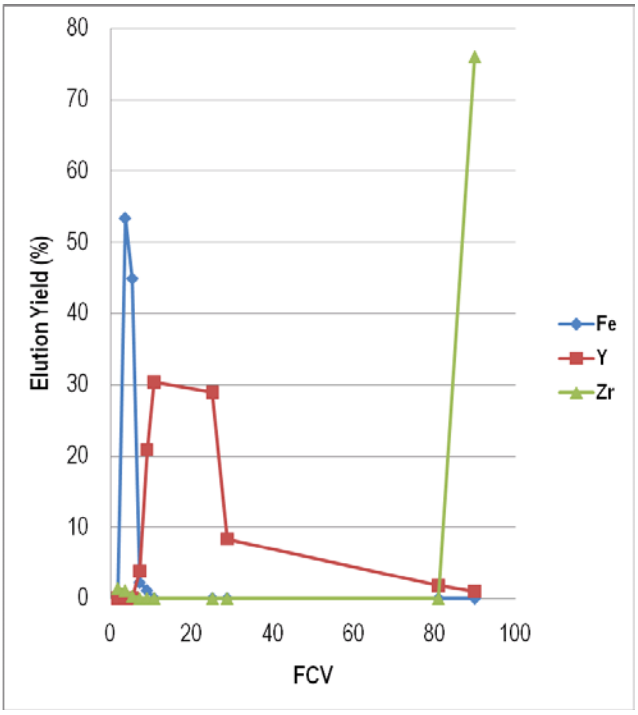


Figure 4 : *Elution curves of Fe, Y and Zr (3).*

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).*

AGENDA

° ARABLAB - 10-13 January 2009, Dubai (United Arab Emirates)

° European Winter Conference on Plasma Spectrochemistry - 15–20 February 2009, Graz (Austria)

° 14th Expert Level Meeting on Environmental Radioactivity Surveillance – 24-26 March 2009, Berlin (Germany)

° 5th Local Radiochemical Conference – May 2009, Krakow (Poland)

° Procorad - 24-26 June 2009, Grenoble (France)

° Goldschmidt Conference – 21-26 June 2009, Davos (Switzerland)

° 17th International Conference on Radionuclide Metrology and its Applications (ICRM 2009) - 7–11 September 2009, Bratislava (Slovakia)

° The 12th Workshop on Progress in Analytical Methodologies for Trace Metal TRACESPEC 2009 – 15-18 September 2009, Mainz (Germany)

IN BRIEF

Our first customer satisfaction survey has been sent by e-mail on 18 of November, and we thank all of you that have already answered. We are to re-send it for those who could not answer the previous one. Your feedback is very important as it allows us to adjust and improve our services and products to your needs and expectations.

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).*

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. The recovery of Y in the iron-free fractions 10.8 – 81FCV is 69.3%. A higher iron decontamination could be obtained in increasing the number of fractions between 5.4 to 9FCV (by diminishing elution volume from 1.8 to 1FCV for example).

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.

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 = Vaq(A0-As)/(m.As) – Vaq :volume of the aqueous phase, m :mass of resin, A0 and As : respective activities in the aqueous phase before and after extraction of the resin (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)

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