PRODUCT SHEET

TRU resin

Main Applications

- Separation of actinides
- Separation of iron

Packing

Order N°.	Form	Particle size
TR-B25-A, TR-B50-A, TR-B-100-A, TR-B200-A	25g, 50g, 100g and 200g bottles TRU resin	100-150 µm
TR-C20-A, TR-C50-A , TR-C200-A	20, 50 and 200 2 mL TRU resin columns	100-150 µm
TR5-C20-A, TR8-C20-A , TR10-C20-A	20 5, 8 and 10 mL TRU resin columns	100-150 µm
TR-B25-S, TR-B50-S, TR-B100-S, TR-B200-S	25g, 50g, 100g and 200g bottles TRU resin	50-100 µm
TR-R50-S, TR-R200-S	50 and 200 2ml cartridges TRU resin	50-100 µm
TR-B01-F	Bottle (min. 10 g) TRU resin	20-50 µm

Physical and chemical properties

Density : 0,37 g/ml
Capacity : 7 mg Nd/g Resin TRU

Conversion factor D_W/k' : 1,82

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

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PRODUCT SHEET

Methods*

Reference	Description	Matrix	Analytes	Support
ACU02	Americium, Plutonium and Uranium in urine	urine	Am, Pu and U	columns
ACU02 VBS	Americium, Plutonium and Uranium in urine (Vakuum Box System)	urine	Am, Pu and U	cartridges
ACW03	Americium, Plutonium and Uranium in water	water	Am, Pu and U	columns
ACW03 VBS	Americium, Plutonium and Uranium in water (Vakuum Box System)	water	Am, Pu and U	cartridges
ACW04	Americium in water	water	Am	columns
ACW16 VBS	Am_Np_Pu_Th_Cm_U in water (Vakuum Box System)	water	Am, Np, Pu, Th, Cm and U	cartridges
ACW17 VBS	Am_Np_Pu_Th_Cm_U_Sr in water (Vakuum Box System)	water	Am, Np, Pu, Th, Cm, U and Sr	cartridges
FEW01	Iron-55 in water	water	Fe-55	columns

*developped by Eichrom Technologies Inc.

LITERATURE STUDY

TRU RESIN

TRU Resin characteristics and properties are given by the synergistic combination of CMPO (octylphenyl-N,N-di-isobutyl carbamoyle phosphine oxyde) extractant diluted in TBP (fig. 1). TRU Resin is used for the extraction and separation of TRansUranian elements, including americium, contrarily to TEVA or UTEVA Resins.

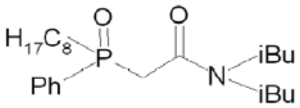

Figure 1: *CMPO*

Assumed extraction equilibria:

$$Am^{3+} + 3NO_3^- + 3\bar{E} \Leftrightarrow \overline{E_3 \cdot Am(NO_3)_3}$$

(Ln^{3+})

$$Pu^{4+} + 4NO_3^- + 2\bar{E} \Leftrightarrow \overline{E_2 \cdot Pu(NO_3)_4}$$

(Np^{4+})

$$UO_2^{2+} + 2NO_3^- + 2\bar{E} \Leftrightarrow \overline{E_2 \cdot UO_2(NO_3)_2}$$

with E = extractant

Figures 2 and 3 show the elution profils of different radionuclides in HNO_3 and HCl media. Transuranium elements show a high affinity for the resin for increasing HNO_3 concentration. Americium also shows a good affinity for the resin: $k'_{(Am)max}$ ~100 for a concentration of HNO_3 from 1 - 3M. Np(V) is not retained on the TRU Resin at high HNO_3 concentrations whereas Np(IV) is very well fixed under the same conditions. This different behaviour between the two oxidation states of Np allows the separation of this element from other actinides.

Fe(III) shows no affinity for the resin in the acidity range of 0.05 - 2M HNO_3. Above 2M HNO_3, 2M Fe(III) affinity is increasing with the HNO_3 concentration. TRU Resin properties towards Fe can be used for the separation and measurement of Fe-55 (cf Eichrom method FEW01). Fe(III) is fixed on the resin at 8M HNO_3 and eluted either with 1-2M HNO_3 solution. Alternatively ascorbic acid can be used for elution since Fe(II) is not retained on the resin.

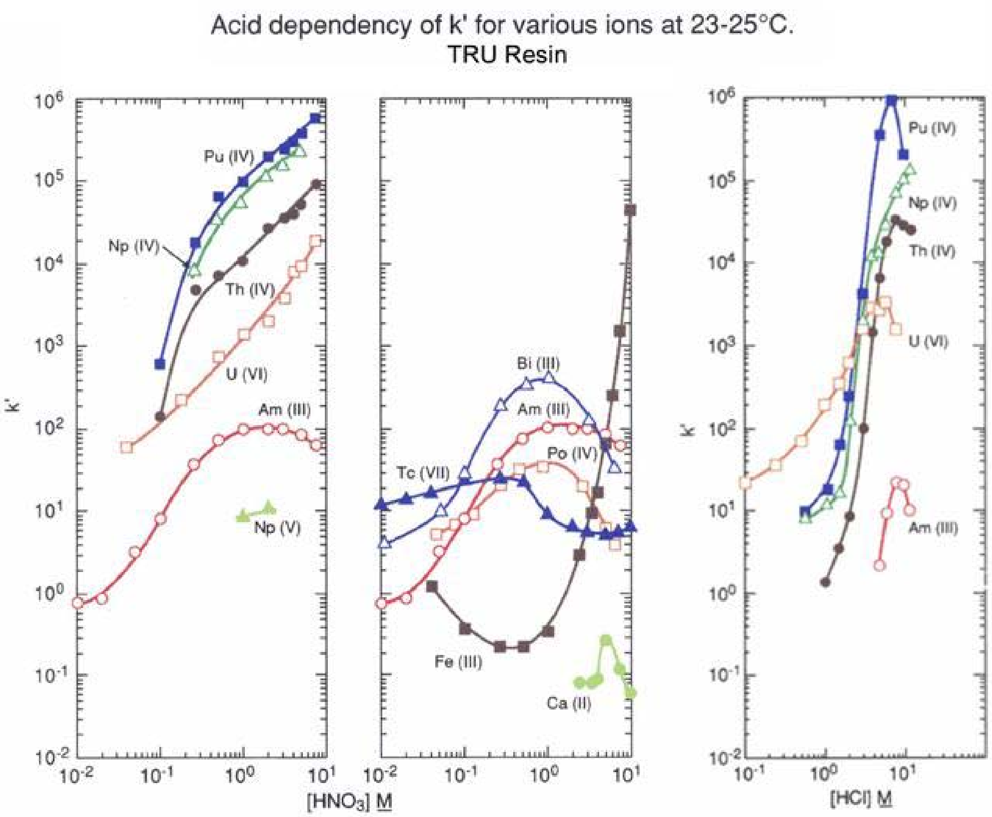

Figure 2 : *Elution profiles of different elements in HNO_3 and HCl media on TRU Resin [1]*

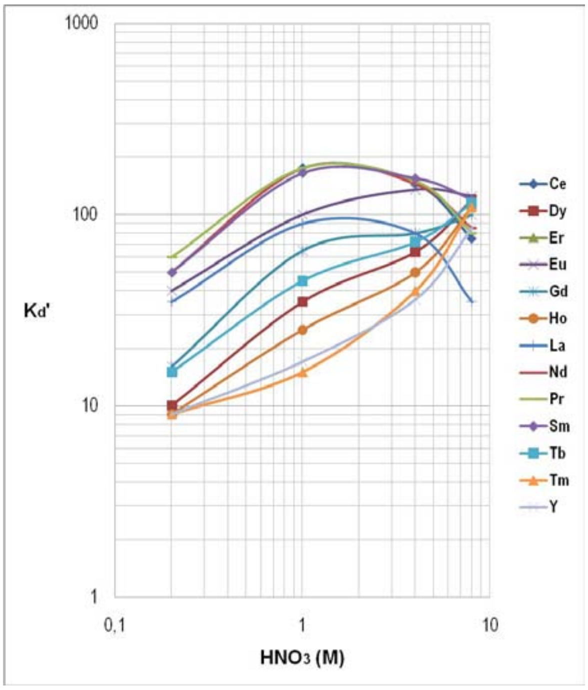

Figure 3 : *Elution profiles of Lanthanides on TRU resin in* HNO_3 *(2).*

In HCl media, Am(III) is not retained on TRU Resin. Pu(IV), Np(IV), Th(IV) and U(VI) show very high affinity for HCl concentrations higher than 3M. Affinity of these elements for the resin is decreasing with decreasing HCl concentration. Figure 3 shows that the heavier lanthanides are in general better retained than the lighter ones.

Figure 4 shows that calcium and Fe(II) do not interfere Am retention. However, a concentration of Fe(III) greater than 10^{-3}M in 2M HNO_3 prevents any uptake of Am. On the contrary, the presence of more than 0.1M aluminum enhances Am(III) uptake. Phosphates, sulfates and oxalic acid start slightly interfering Am uptake when their concentration is greater than 0.1M (figure 5).
The same salts do interfere strongly the uptake of Np(IV), especially oxalate.
However, k'Np(IV) remains greater than 1000 for salt concentrations less than 0.05M for oxalates and 0.3M for sulfates (figure 5).

In 1M HCl medium, Np(IV) shows no affinity for TRU Resin. The use of oxalic acid in a concentration higher than 10^{-2}M in 1M HCl, makes the Np(IV) elution faster.
In the same acidic medium, U(VI) remains on the resin up until the oxalic acid concentration reaches 0.1M (figure 6) allowing easy Np/U separation in HCl medium.

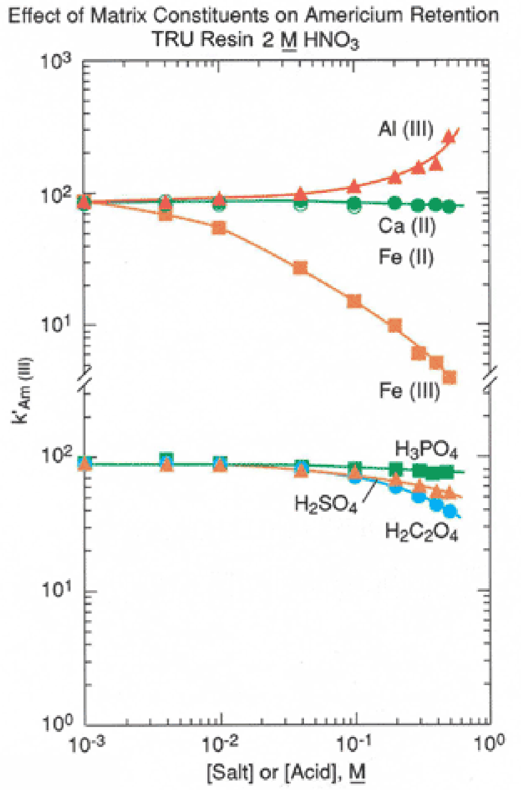

Figure 4 : *Matrix effects on Am(III) retention(1).*

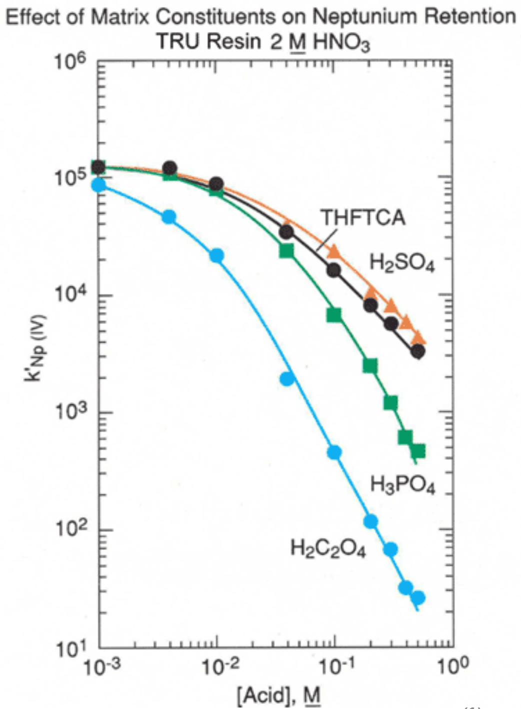

Figure 5 : *Matrix effects on Np(IV) retention(1).*

LITERATURE STUDY

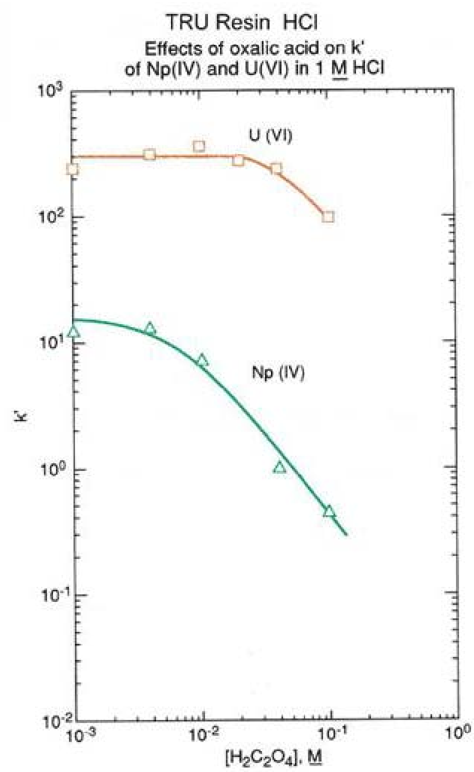

Figure 6 : *Oxalic acid interference on the uptake of Np(IV) and U(VI) (1)*

Bibliography

(1) Horwitz P., Chiarizia R. Dietz M., Diamond H., Nelson, D. ; *Analytica Chimica Acta*, 281, pp. 361-372 (1993)

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