PRODUCT SHEET

TK200 Resin

Main Applications

- Separation of actinides
- Separation of Ga isotopes (in combination with ZR Resin)

Packing

Order N°.	Form	Particle size
TK200-B25-A, TK200-B50-A, TK200-B-100-A, TK200-B200-A	25g, 50g, 100g and 200g bottles TK200 Resin	100-150 µm
TK200-C20-A, TK200-C50-A	20 and 50 2 mL TK200 Resin columns	100-150 µm
TK200-B25-S, TK200-B50-S, TK200-B100-S, TK200-B200-S	25g, 50g, 100g and 200g bottles TK200 Resin	50-100 µm
TK200-R10-S	10 2mL TK200 Resin cartridges	50-100 µm

Physical and chemical properties

Density: 0.4 g/mL TK200 Resin

Conditions of utilization

Recommended T of utilization : 20-25°C
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

TRISKEM INTERNATIONAL
ZAC de l'Eperon – 3, rue des Champs Géons – 35170 Bruz – FRANCE
Tel +33 (0)2.99.05.00.09 – Fax +33 (0)2.23.45.93.19 – www.triskem.com – email : contact@triskem.fr
SAS au capital de 100.000 euros – SIRET 493 848 972 00029 – APE 2059Z – TVA intra communautaire FR65 493 848 972

TRISKEM
Expertise in Separation Chemistry

PRODUCT SHEET

TK200 RESIN

The TK200 Resin is based on TriOctylPhosphine Oxide (TOPO, fig. 1) an extractant widely used in the extraction of various metal ions[1].

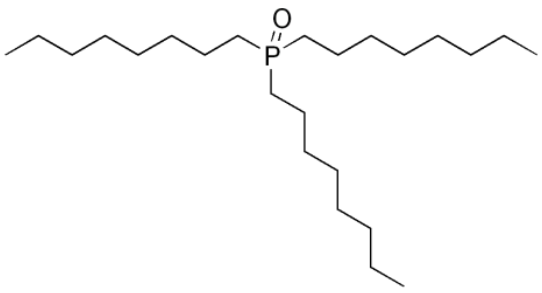

Figure 1: Trioctylphosphine oxide (TOPO)

Graphs 2 – 15 show the selectivity of the TK200 Resin for a wide range of elements in HNO_3 (fig. 2 – 8) and HCl (fig. 9 – 15). All Dw shown in these graphs were obtained through ICP-MS measurements.

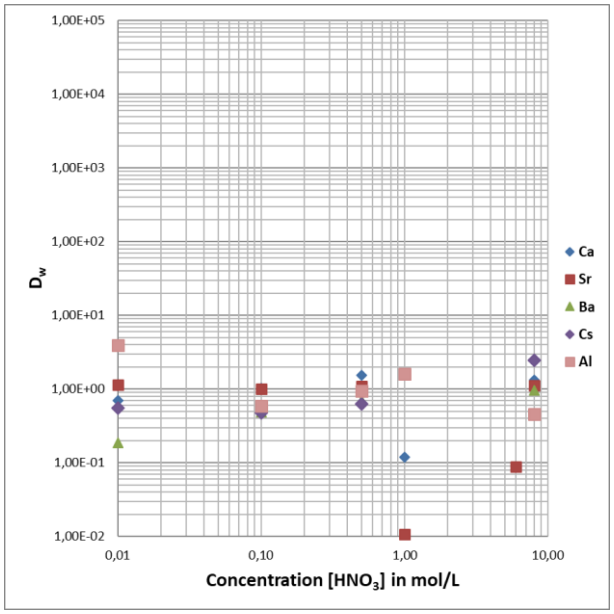

Figure 2: Dw values of selected elements on TK200 Resin in HNO_3

The TK200 Resin shows no significant retention of commonly found matrix elements such as Ca and Al in HNO_3.

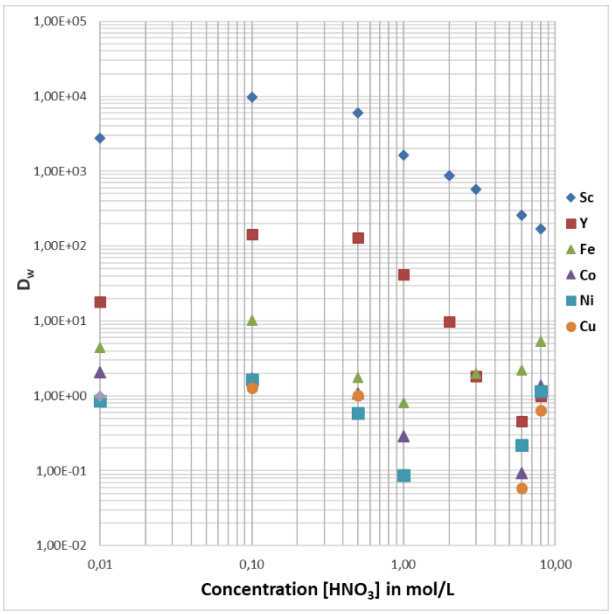

Figure 3: Dw values of selected elements on TK200 Resin in HNO_3

Y and especially Sc are retained on the TK200 resin in HNO_3 while Fe, Co, Ni and Cu show no or only very little retention.

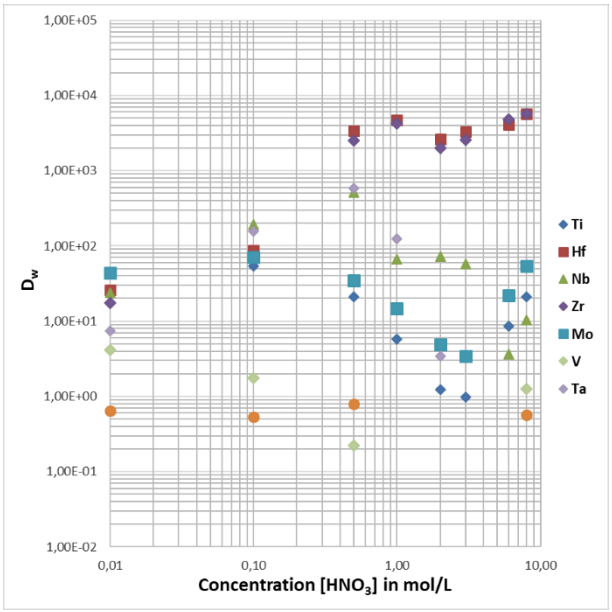

Figure 4: Dw values of selected elements on TK200 Resin in HNO_3

The TK200 Resin shows very high retention of Hf and Zr at elevated HNO_3 concentrations while numerous other elements like Ti and Mo are not well retained under these conditions, especially at 2 – 3M HNO_3.

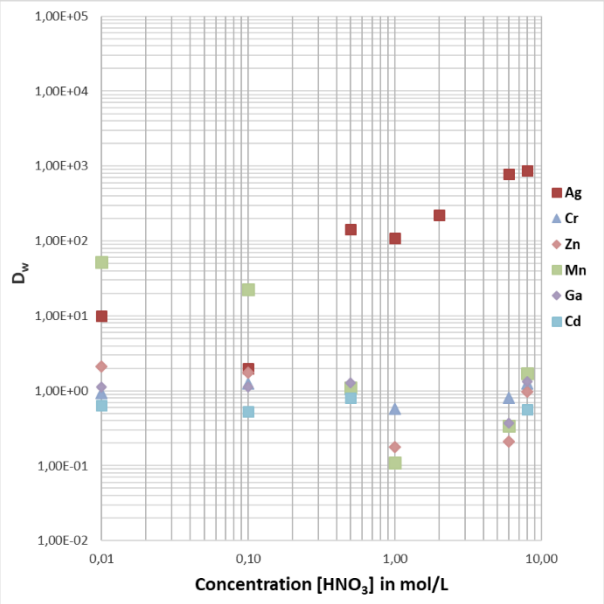

Figure 5: Dw values of selected elements on TK200 Resin in HNO_3

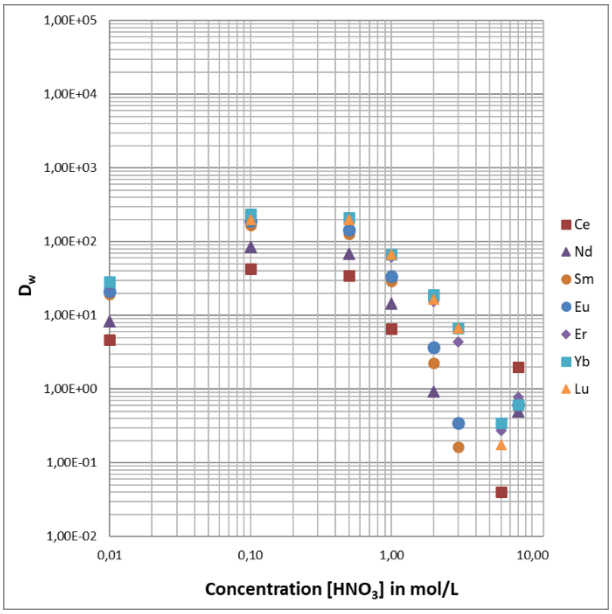

Figure 6: Dw values of selected elements on TK200 Resin in HNO_3

Lanthanides are only retained at medium-high HNO_3 concentrations (between 0.1M and 1M HNO_3), however Dw values are generally not very high.

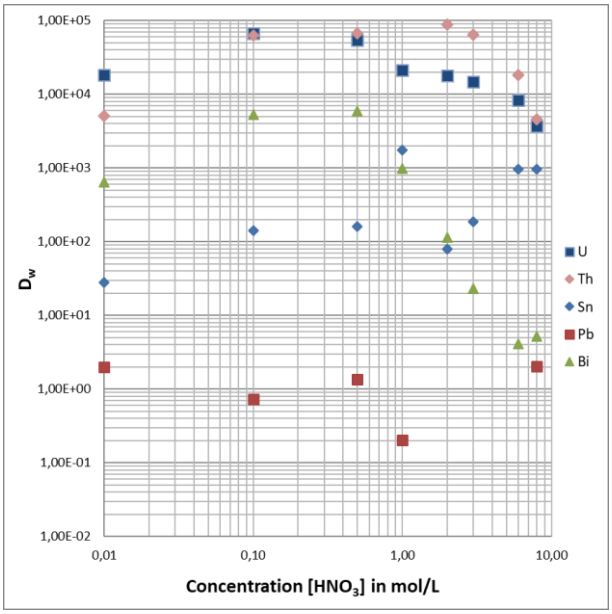

Figure 7: Dw values of selected elements on TK200 Resin in HNO_3

U and Th are very well retained over the whole HNO_3 concentration range tested, including 0.01M HNO_3. Pb is not retained, while Bi is very well retained at lower acid concentrations and may be eluted at 6 – 8M HNO_3.

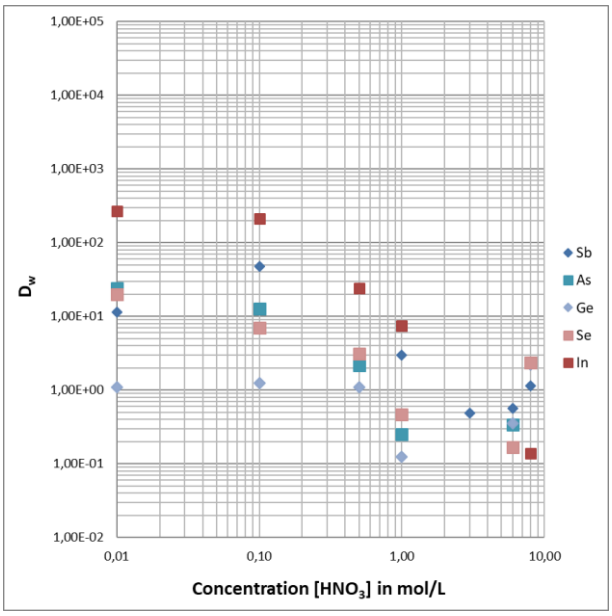

Figure 8: Dw values of selected elements on TK200 Resin in HNO_3

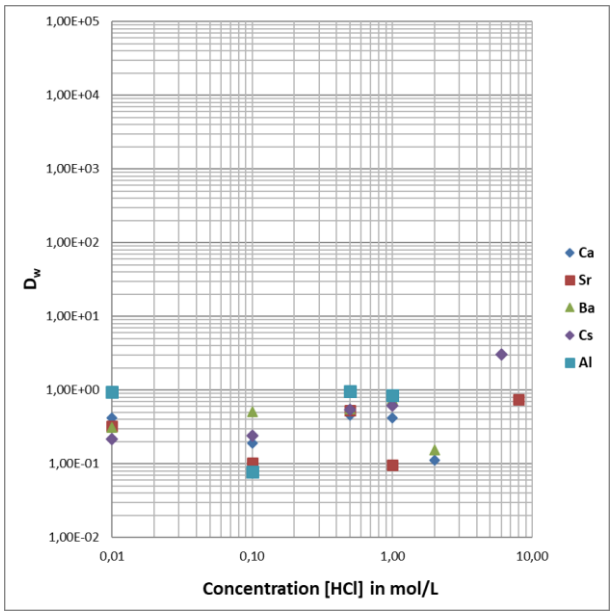

Figure 9: Dw values of selected elements on TK200 Resin in HCl

Like in HNO_3, the TK200 Resin shows no selectivity for matrix elements such as Ca and Al in HCl.

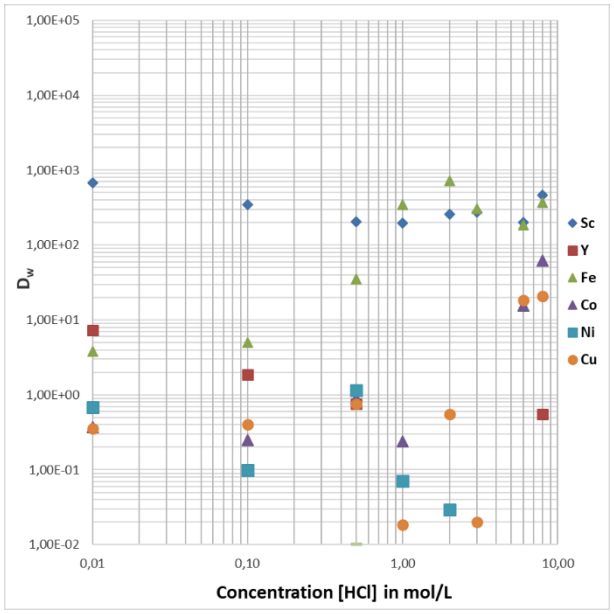

Figure 10: Dw values of selected elements on TK200 Resin in HCl

Sc is well retained over the whole HCl range, elution might thus be challenging. Fe is very well retained at HCl concentrations > 1M HCl.

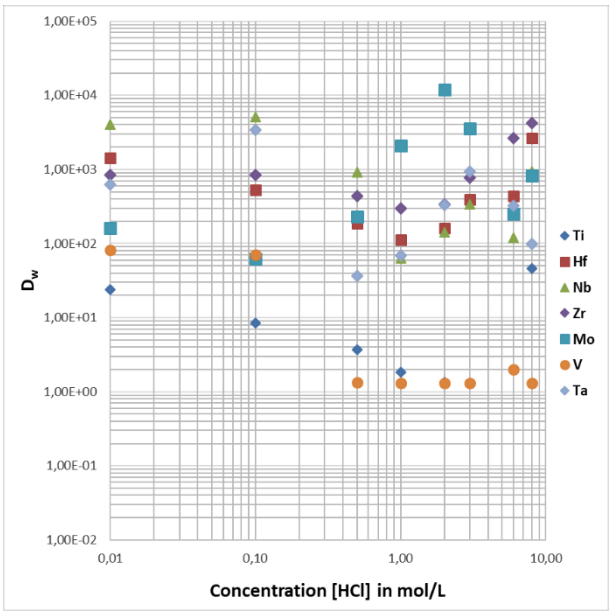

Figure 11: Dw values of selected elements on TK200 Resin in HCl

Polyvalent cations such as Zr, Mo and Ta, except for Ti and V, are generally well retained in HCl, especially at elevated HCl concentrations.

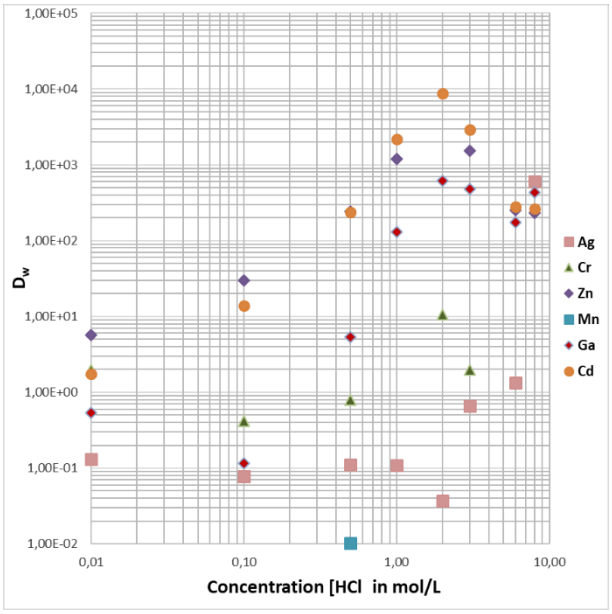

Figure 12: Dw values of selected elements on TK200 Resin in HCl

Cd, Zn and Ga are very well retained at HCl concentrations > 1M HCl. This is especially interesting with respect to Ga separation chemistry as Ga is not retained at 1 – 2M HCl on most resins.

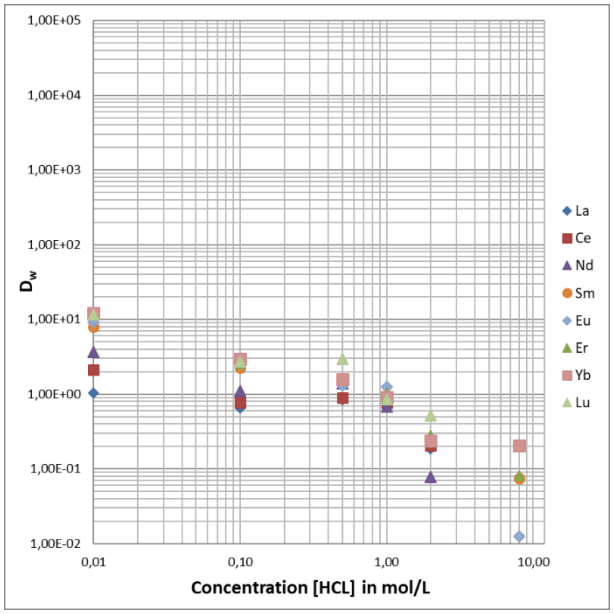

Figure 13: Dw values of selected elements on TK200 Resin in HCl

Lanthanides are not extracted by the TK200 Resin from HCl.

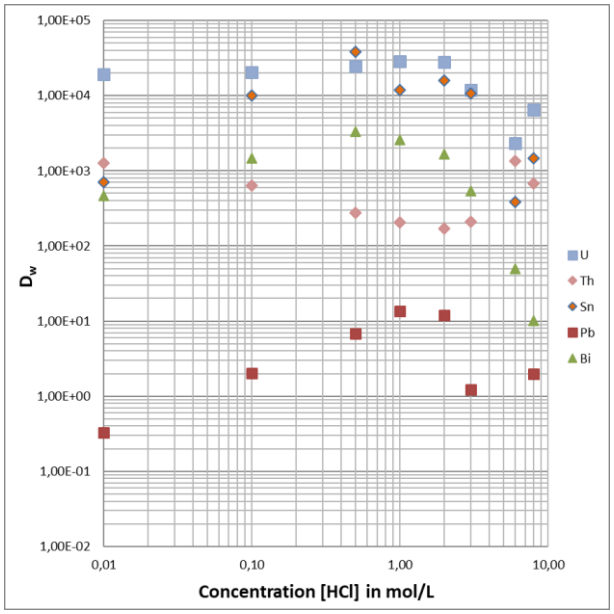

Figure 14: Dw values of selected elements on TK200 Resin in HCl

U and Sn are well retained over the whole HCl concentration range, Th is also retained, but to a lesser degree. Pb is not retained, while Bi is only retained at HC concentrations < 3M.

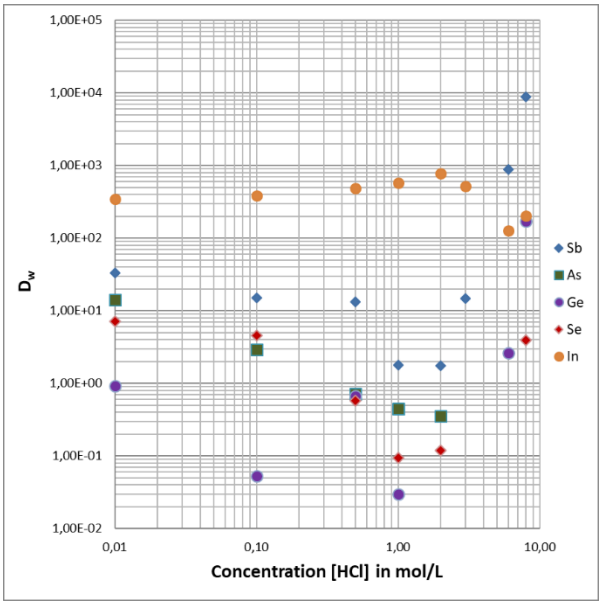

Figure 15: Dw values of selected elements on TK200 Resin in HCl

The TK200 Resin shows with respect to its selectivity the potential to find use in numerous applications. One typical example is connected to the separation of Gallium isotopes (especially Ga-68) from irradiated Zn targets for medical use using ZR Resin. ZR Resin is very well suited for the separation of Ga from Zn, under low acid conditions (e.g. 0.1M HNO_3 often employed for liquid targets) as well as at high acid conditions (e.g. 10M HCl, conditions often used for the dissolution of solid Zn targets).
An elution study showing the separation of Ga from Zn and potential impurities on ZR Resin is shown in fig. 16.

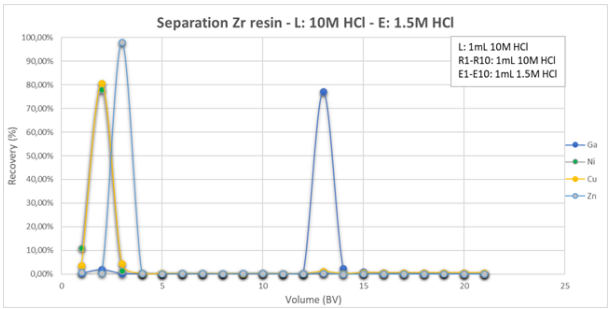

Figure 16: Ga/Zn separation on ZR Resin - load from 10M HCl

Ga is eluted in a small volume (1 – 2 column volumes) of 1.5M HCl, conditions too acidic for direct use in labelling reactions. The TK200 Resin on the other hand allows for Ga extraction at 1.5M HCl, followed by Ga elution using aqueous solutions (fig. 17).
It should be noted though that no Ga/Zn separation is taking place on the TK200 Resin.

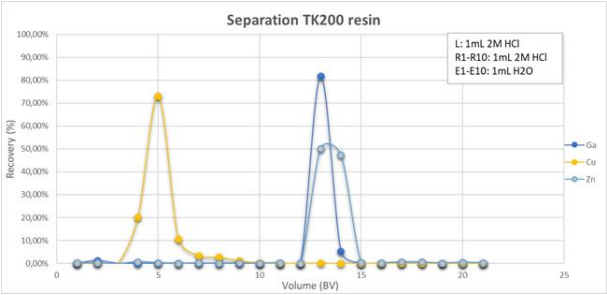

Figure 17: Ga elution from TK200 resin with water following load from 1.5M HCl

Further to the determination of Dw values for a wide range of elements using ICP-MS Dw values were also determined for actinide elements using liquid scintillation counting (all data courtesy of Dr. Nora Vajda, RadAnal Kft). The following graphs summarize the obtained results.

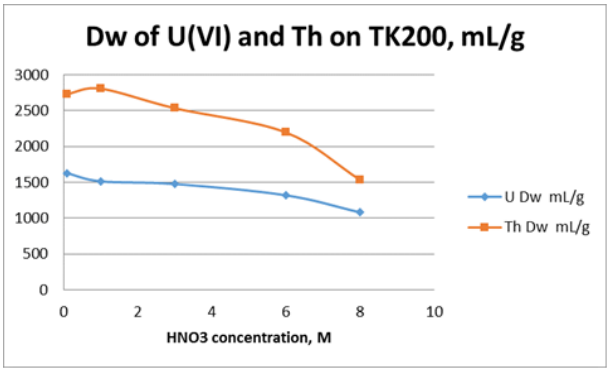

Figure 18: Dw values of U and Th on TK200 Resin in HNO_3 (all data courtesy of Nora Vajda)

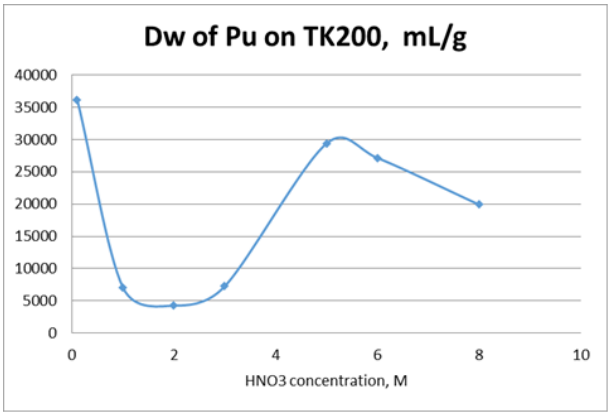

Figure 19: Dw values of Pu(IV) on TK200 Resin in HNO3 (all data courtesy of Nora Vajda)

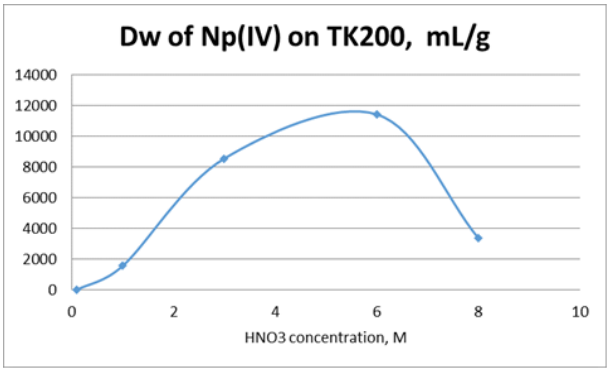

Figure 20: Dw values of Np on TK200 Resin in HNO_3 (all data courtesy of Nora Vajda)

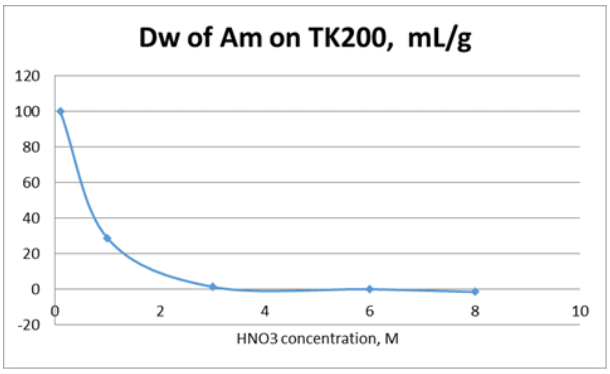

Figure 21: Dw values of Am on TK200 Resin in HNO_3 (all data courtesy of Nora Vajda)

Overall the TK200 Resin shows a very interesting selectivity towards the actinides in HNO_3. Beside Am all actinides tested show very high Dw values at elevated HNO_3 concentrations allowing for strong retention. U, Th and Pu (but not Np and Am) are further very well retained at 0.01M HNO_3, condition frequently used for the storage of collected samples. This opens the possibility of preconcentrating these actinides from collected samples directly after acidification. It could indeed be shown that even at flow rates as high as 10 mL/min these actinides could be quantitatively retained on the TK200 Resin. A method for the sequential separation of U, Th and Pu on the TK200 Resin after their concentration on the same column is currently under way.

Figures 22 – 24 show Dw values of selected actinides in HCl.

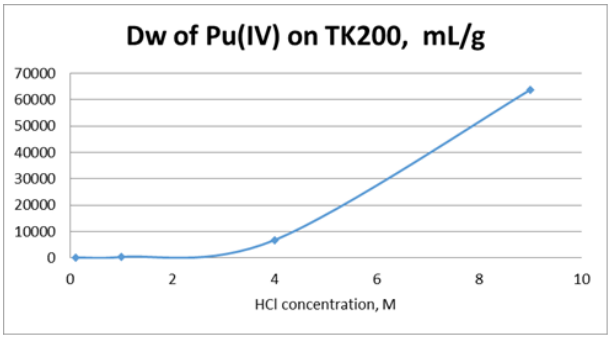

Figure 22: Dw values of Pu(IV) on TK200 Resin in HCl (all data courtesy of Nora Vajda)

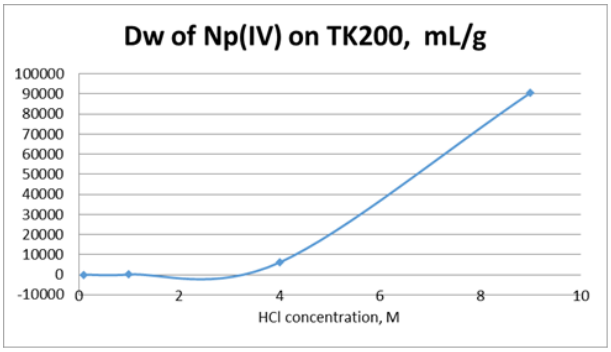

Figure 23: Dw values of Np(IV) on TK200 Resin in HCl (all data courtesy of Nora Vajda)

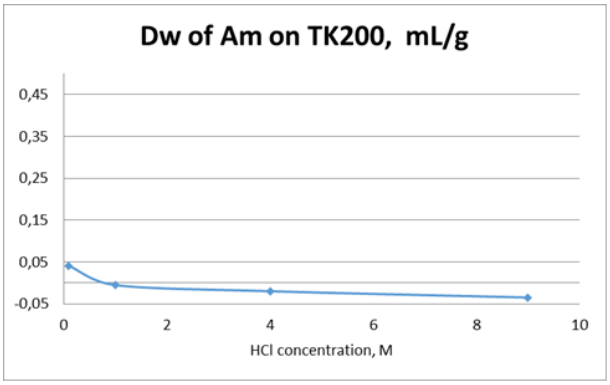

Figure 24: Dw values of Am on TK200 Resin in HCl (all data courtesy of Nora Vajda)

While Dw values for Pu(IV) and Np(IV) are generally very high at elevated HCl concentrations Am is not retained.

As indicated, initial elution studies show the potential of the TK200 Resin for the concentration and separation of actinides from acidified water samples, figures 25 to 27 show some first results of such elution studies, method optimisation is on-going.

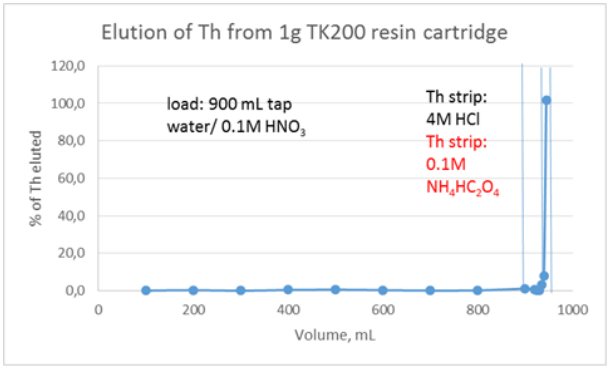

Figure 25: Elution study Th retention and elution on TK200 Resin (all data courtesy of Nora Vajda)

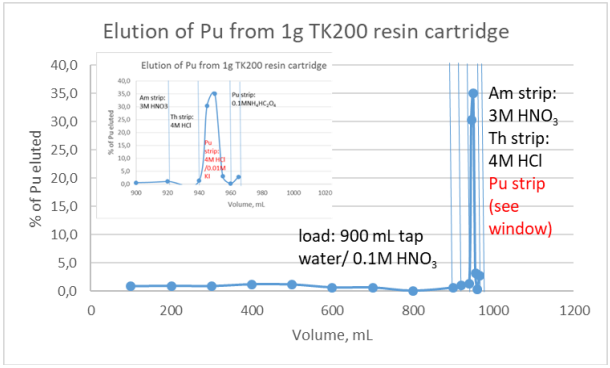

Figure 26: Elution study Pu retention and elution on TK200 Resin (all data courtesy of Nora Vajda)

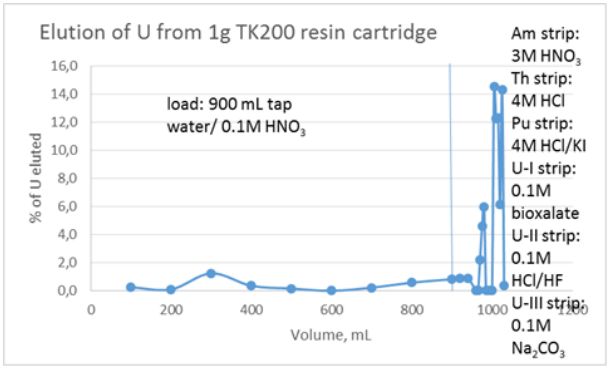

Figure 27: Elution study U retention and elution on TK200 Resin (all data courtesy of Nora Vajda)

Figure 28 shows that a clean U/Th separation can easily be obtained on the TK200 Resin.

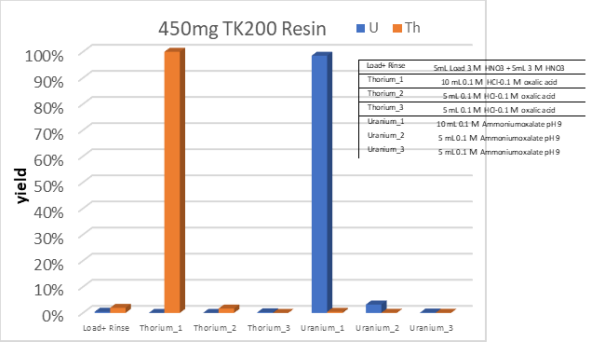

Figure 28: Elution study U/Th separation on TK200 Resin (all data courtesy of Carina Dirks)

A number of separation methods based on the TK200 Resin are currently being developed.

Bibliography

(1) T. Braun and G. Ghersini.(eds.): Extraction chromatography. Elsevier Scientific Pub. Co., 1975