PRODUCT SHEET

TK201 RESIN

Main Applications

- Separation of technetium
- Separation of rhenium
- Separation of Cu isotopes (in combination with CU Resin)

Packing

Order N°.	Form	Particle size
TK201-B25-A, TK201-B50-A, TK201-B-100-A, TK201-B200-A	25g, 50g, 100g and 200g bottles TK201 Resin	100-150 µm
TK201-C20-A	20 x 2 mL TK201 Resin columns	100-150 µm
TK201-B25-S, TK201-B50-S, TK201-B100-S, TK201-B200-S	25g, 50g, 100g and 200g bottles TK201 Resin	50-100 µm
TK201-R10-S	10 2mL TK201 Resin cartridges	50-100 µm

Physical and chemical properties

Density: 0.35 g/mL TK201 Resin

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

TRISKEM INTERNATIONAL
ZAC de l'Eperon – 3, rue des Champs Géons – 35170 Bruz – FRANCE
Tel +33 (0)2.99.05.00.09 – www.triskem.com – email : contact@triskem.fr / support@triskem.fr

TRISKEM
Expertise in Separation Chemistry

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The TK201 Resin is based on a tertiary amine, it further contains a small amount of a long-chained alcohol (radical scavenger) to increase its radiolysis stability. The TK201 Resin acts as a weaker ion pair binding agent than to the TEVA Resin, accordingly it is generally possible to elute under softer conditions. Its main application is the separation of anionic species such as Tc(VII) or Re(VII).

Graph 1 shows the Dw values for Tc in HNO_3 and HCl.

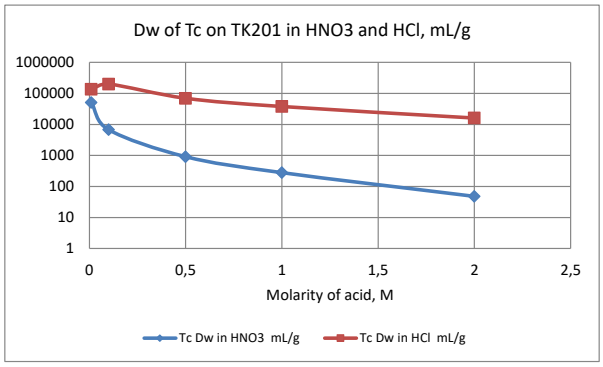

Figure 1: Dw values of Tc on TK201 Resin in HCl and HNO_3, obtained by LSC, data provided by N. Vajda (RadAnal)

Tc(VII) is very well retained at low acid concentrations. Its retention is generally significantly higher in HCl than in HNO_3, even at elevated HCl concentration such 2M it remains very strongly retained. In HNO_3 on the other hand its retention is rather low at concentrations above 2M.

Graphs 2 – 6 show the selectivity of the TK201 Resin for a wide range of elements in HCl (fig. 2 – 4) and HNO_3 (fig. 5 and 6). All Dw shown in these graphs were obtained through ICP-MS measurements.

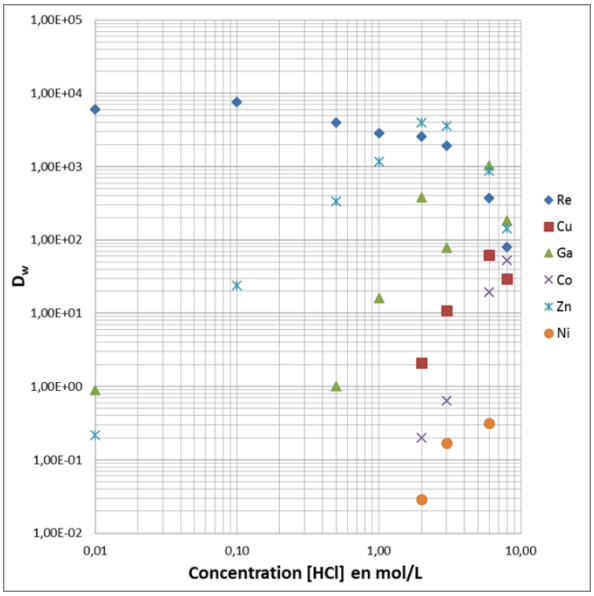

Figure 2: Dw values of selected elements on TK201 Resin in HCl

As expected, the TK201 Resin shows very high retention of Re(VII) in HCl even at rather elevated acid concentrations. Further Zn, Ga and Cu are retained, especially the latter allows for its use in radiopharmaceutical applications.

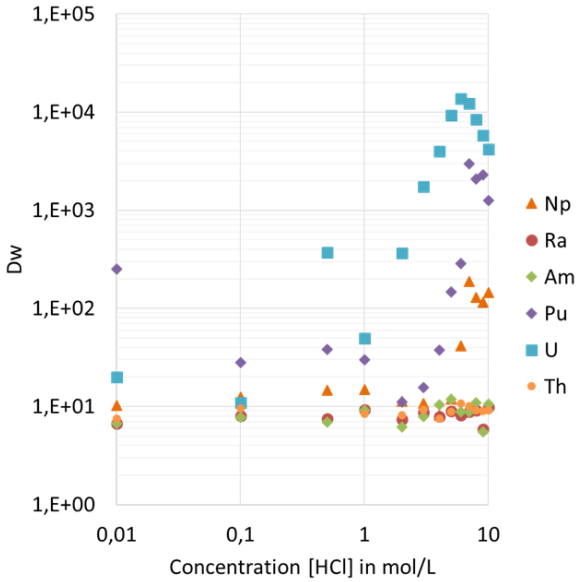

Figure 3: Dw values of selected elements on TK201 Resin in HCl, data provided by Russell et al. (NPL)

The TK201 Resin also shows strong retention of U and Pu at elevated HCl concentrations, both might subsequently be eluted in dilute acid.

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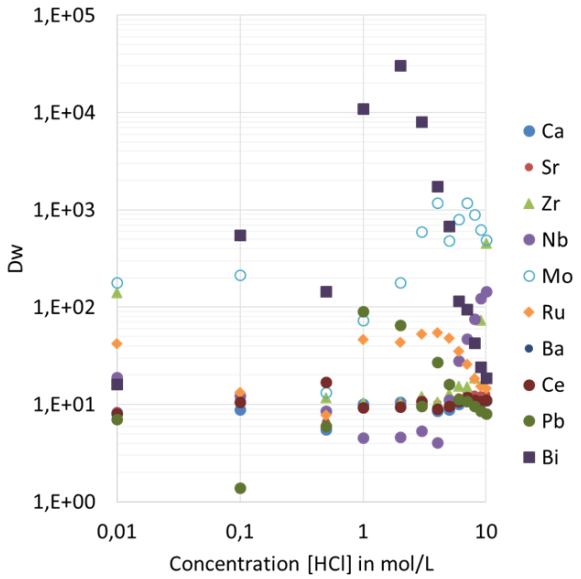

Figure 4: Dw values of selected elements on TK201 Resin in HCl, data provided by Russell et al. (NPL)

The TK201 Resin further strongly retains Bi and Mo at elevated HCl concentrations, while other elements tested show no or only very low retention (Ru, Nb).

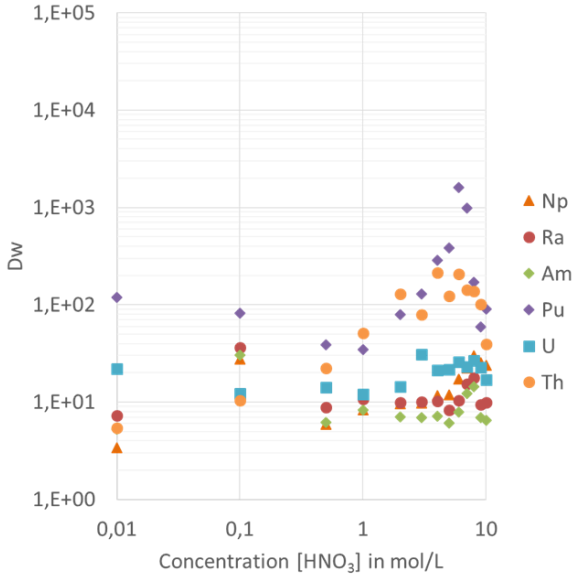

Figure 5: Dw values of selected elements on TK201 Resin in HNO_3, data provided by Russell et al. (NPL)

The TK201 Resin generally shows rather limited selectivity in HNO_3, similar to Tc(VII) Re is well retained at low HNO_3 concentrations (0.01 – 0.1M HNO_3). At elevated HNO_3 concentrations Pu is well retained and Th fairly well, other actinides are not retained under these conditions.

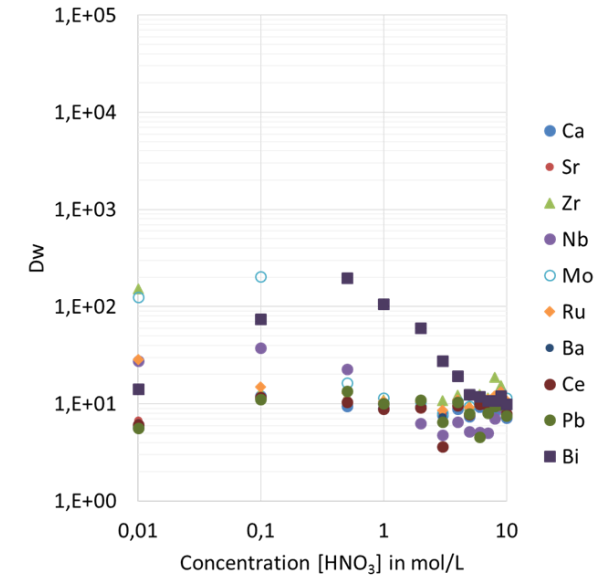

Figure 6: Dw values of selected elements on TK201 Resin in HNO_3, data provided by Russell et al. (NPL)

Out of the other elements tested only Bi (at about 0.5M HNO_3) and Mo (at low HNO_3 concentrations) are retained. It is important to note that Mo is not retained at HNO_3 concentrations above 0.5M while Tc and Re are well retained (Fig. 1), allowing for their clean separation.

It is important to note that Mo is not retained at HNO_3 concentrations above 0.5M while Tc and Re are well retained (Fig. 1), allowing for their clean separation.

It could further be shown by Vajda et al. that Dw values for Tc(VII) are very low in dilute NH_4OH: in 0.1M NH_4OH Tc(VII) shows a Dw of only ~2, accordingly it is easily eluted by ≥ 0.1M NH_4OH.

Additional elution studies indicated that an efficient Mo separation from Re is possible (Fig. 7) using 0.7M HNO_3 for Mo removal and dilute NH_4OH for Re elution.

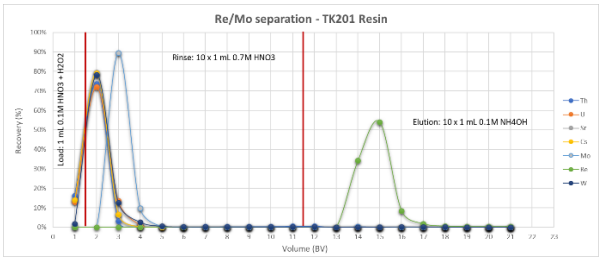

Figure 7: Elution study, Re separation from various elements (incl. Mo and W).

Vajda et al. could confirm that Tc is, like Re, not eluted in 0.7M HNO_3, validating that Re is a good surrogate for Tc and thus also allowing an efficient Mo/Tc separation. Most suitable conditions for Tc elution were found to be NH_4OH greater or equal to 0.2M (Fig. 8).

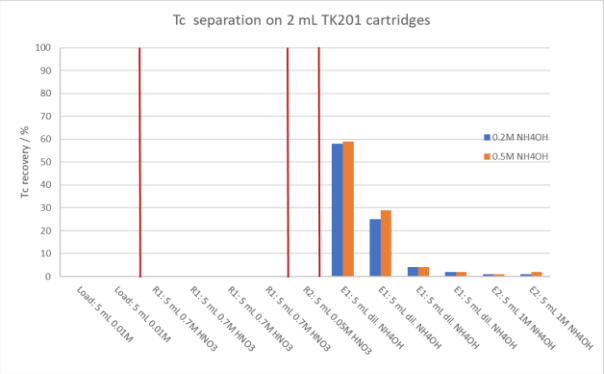

Figure 8: Elution study, Tc separation on 2 mL TK201 cartridges, data provided by N. Vajda (RadAnal)

Another application of the TK201 Resin is the separation of Cu isotopes, in combination with the CU Resin, from irradiated solid Ni targets. While CU Resin shows very high selectivity for Cu over Ni, Zn, Ga,… it requires loading at pH ≥ 2 which is not easily compatible with solid Ni target dissolution and separation chemistry, as these are generally dissolved in strong HCl.

TK201 Resin may be used to retain Cu from 6M HCl, while letting Ni pass for subsequent recycling. The Cu may then be eluted under suitable conditions (e.g. using a mixture of NaOH and acetate buffer at pH 3) allowing for direct loading onto CU Resin for further purification. It might also be used to convert the Cu fraction eluted from the CU Resin from highly acid (e.g. 6 - 8M HCl) to conditions more suitable for labeling (e.g. dilute HCl) as indicated in Fig. 9.

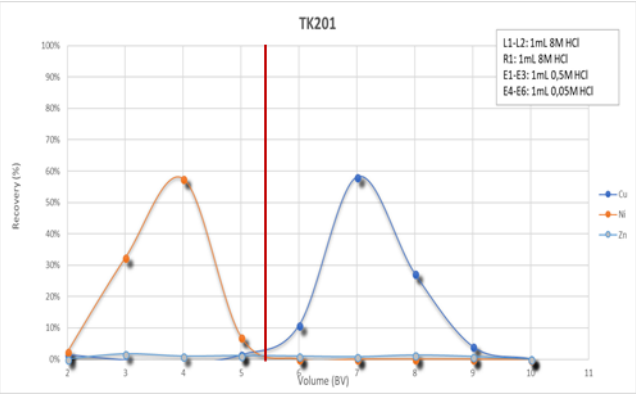

Figure 9: Elution study, Cu conversion on TK201 Resin

Bibliography

(1) A. Bombard et al. “Technetium-99/99m New Resins Developments For Separation And Isolation From Various Matrices”, presented at the ARCEBS 2018, 11-17/11/18 - Ffort Raichak (India)