RadChem Info

TEVA Resin | In Brief | Agenda

N°6 • September 2006

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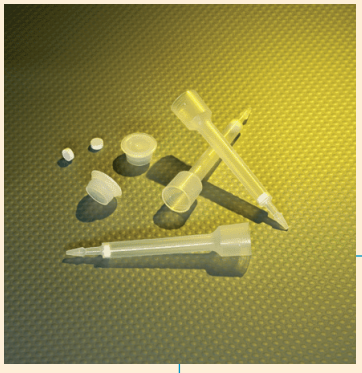

Editorial

In this issue, we continue the review on the characteristics and uses of our chromatographic extraction resins by presenting the TEVA Resin.

In the March issue (N°4), we presented new accessories : Ag and Ni discs, mainly used in the auto-deposition of Po-210. The comparative analysis on Po-210 auto-deposition yield on both Ag and Ni discs has been completed and the results are presented page 3.

The last page of this issue contains the registration form for the Eichrom Users' Group Meeting held in Bratislava, Slovakia, on November 10th. Please do not hesitate to register or to contact us for further informations.

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TEVA Resin

The extractant that gives is specificity to the TEVA Resin is a quaternary ammonium salt, also called Aliquat® 336 (fig. 1). TEVA Resin is mainly used to fix TEtraVAlent actinides and Technetium.

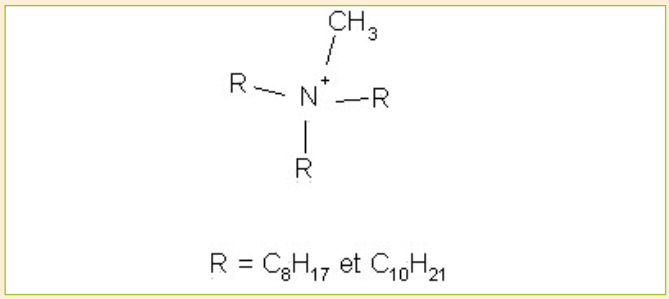

Figure 1 : Quaternary ammonium salt.

The assumed extraction equilibrium is :

$$Pu^{4+} + 4NO_3^- + 2\overline{E \cdot NO_3} \Leftrightarrow \overline{E_2^+ \cdot Pu(NO_3)_6^{2-}}$$

$$(Th^{4+}, Np^{4+})$$

Where E = extractant

Vm (mobile phase)	0,68 mL/mL resin
Vs (stationnary phase)	0,158 mL/mL resin
Resin density	0,35 g/mL resin
Experimental capacity	0,223 mmol Cl^-/ mL resin

Table 1 : *TEVA Resin data[1].*

Elution profiles of the different radionuclides in HNO_3 and HCl are presented figure 2. Pu(IV), Np(IV) and Th(IV) show maximum retention in 2-4M HNO_3. In the acidity range, Am(III) and U(VI) are not fixed.

k' differences between HNO_3 et HCl media may be used to separate Th from the other actinides. When the sample solution in 4M HNO_3 is loaded on the resin, Pu(IV), Th(IV) and Np(IV) are retained. Th may then be eluted with 6M HCl while Pu(IV) and Np(IV) remain on the resin in these conditions. Pu might be stripped out of the resin with 4M HNO_3 or 8M HCl, after having reduced its oxidation state from +IV to +III.

Matrix effects influence the retention of elements. In the presence of Th(IV) in the sample, the retention of Np(IV) might be affected in 5M HNO_3 whereas the presence of uranium has no effect on Np(IV) retention (fig.3).

Phosphates, sulphates and oxalic acid may interfere in the uptake of Np(IV) on the resin according to their concentration in the sample (fig. 4). 0.1M to 0.5M oxalic acid in solution with 0.1M to 0.5M HNO_3 may be used to strip Np(IV) out of the resin.

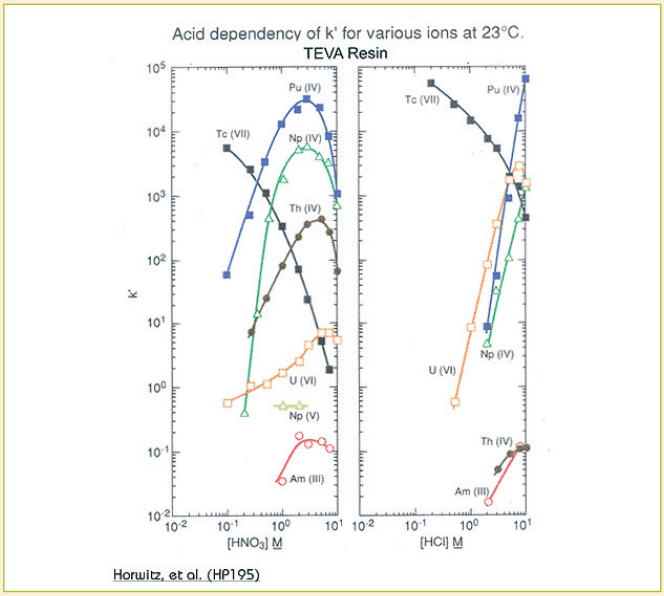

Figure 2 : TEVA Resin elution profils in HNO_3 and HCl solutions.

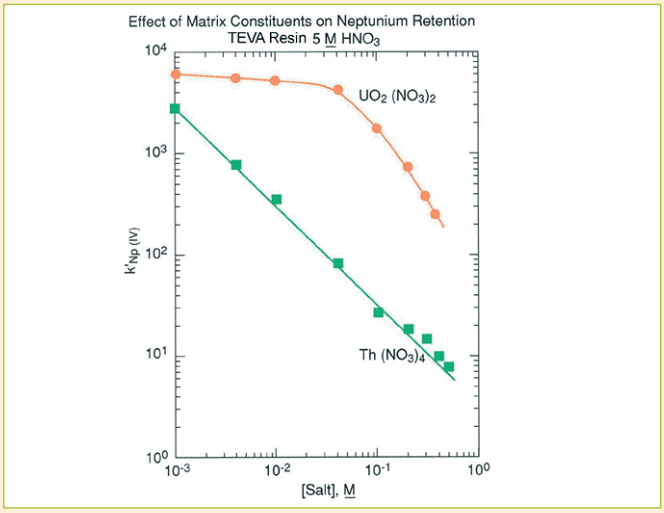

Figure 3 : U(VI) and Th(IV) interferences on Np(IV) retention.

Under specific conditions, Am may be fixed on the TEVA Resin and separated from light lanthanides (fig. 5). In 1-2M NH_4SCN - 0.1M HCO_2H , Am is fixed on the resin while La and Eu are eluted. Am is then stripped out of the resin with 2M HCl[2,3].

TEVA Resin is also known for fixing Technetium under its pertechnetate ion Tc(VII). Tc(VII) is retained on the resin for an acidity range comprised between 0.1 to 1M H^+ (3E+02<k'<6E+04). For the range of acidity, the actinides are not or very few, retained on the resin (Fig. 2). This characteristic has been used to isolate Tc-99 from matrices containing actinides. Tc can be stripped out of the resin with 8M HNO_3[4].

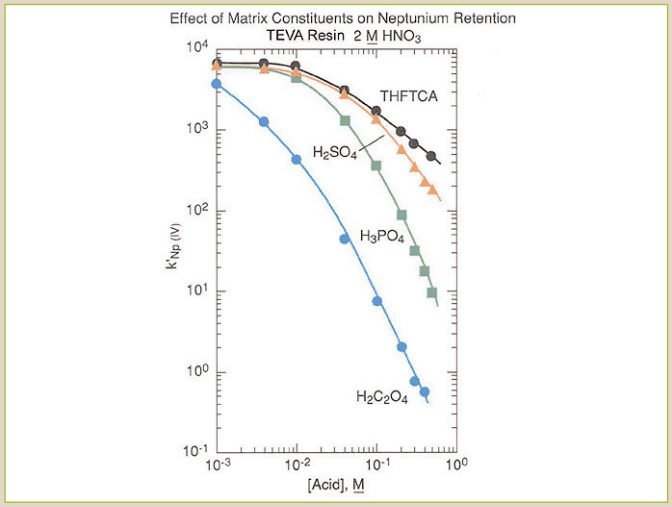

Figure 4 : Matrix effect on Np(IV) retention.

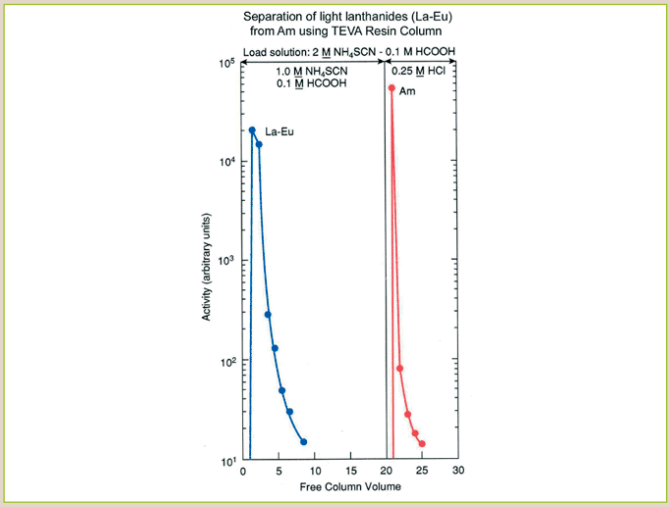

Figure 5 : La-Eu / Am separation.

TEVA Resin is being used to separate Hf from Ti, Zr and REE[5] or to isolate rhenium for its measure by ICP-MS[6]. In both cases, the analysis are made and rock samples. In the first case, the REE, Ti and Hf are in 10.5M HCl solution loaded onto TEVA Resin. REE and Ti are eluted with 6M HCl. Hf is then stripped with 9M HCl. TEVA Resin has been used to isolate Re. Re being the superior homolog of Tc, it has a similar chemistry. Tagami et al.[7] have shown that Tc and Re present similar behaviour on TEVA Resin.

Eichrom methods using TEVA Resin are ACU03, ACW01, ACW04, ACW08, ACW10, ACW13VBS, ACW16 VBS. Associated bibliography is available on our website : http://www.eichrom.com/ (follow « Radiochemistry » then « Bibliography »).

Bibliography

(1) Horwitz P., Dietz M., Chiarizia R., Diamond H., *Analytica Chimica Acta*, **310**, pp. 63-78 (1995); Eichrom reference HP195.
(2) Pimple M., Higgy R. H., *Journal of radioanalyical and Nuclear Chemistry*, **248**(3), pp. 537-541 (2001); Eichrom reference PM101.
(3) Chiarizia R., Gatrone R.C., Horwitz P., *Solvent Extraction and Ion Exchange*, **13**(4), pp. 615-645 (1995); Eichrom reference CR295.
(4) Uchida S., Tagami K., *Analytica Chimica Acta*, **357**, pp. 1-3 (1997); Eichrom reference US197.
(5) Ulfbeck D., Baker J., Waight T., Krogstad E., *Talanta*, **59**, pp. 365-373 (2003).
(6) Tagami K., Uchida S., *Journal of Analytical Atomic Spectrometry*, **16**, pp. 669-671 (2001); Eichrom reference TK101..
(7) Tagami K., Uchida S., *Analytica Chimica Acta*, **405**, pp. 227-229 (2000); Eichrom reference TK100.

Do not hesitate to contact us for more details

In Brief

Po-210 Auto-deposition : Ag or Ni discs ?

Experiments were undertaken to compare Po-210 auto-deposition performances on Ag and Ni discs. Results are presented in table 2. Auto-deposition yield of Po-210 is 99% on Ag discs and 61% in average on Ni discs. Reproducibility is good for Ag but not as efficient with Ni. Resolution for both metals is good. However, auto-deposition time must not exceed 5 hours in the case of Ni discs as the disc surface is being attacked.

N=10	Ag	Ni
Auto-deposition time(h)	5-15h	5h
Auto-deposition yield(%)	99	61
Reproducibility, s_R (%)	8,6	30,1
FWHM (keV)	19,4	19,1

Table 2 : *Comparison data for Po-210 auto-deposition on Ag and Ni discs.*

Agenda

This year, the Users' Group Meeting is held on Friday 10th November in Bratislava, Solvakia. If you would like to participate, please fill the below registration form and send it by either fax (+33 2 23 50 13 90) or by e-mail at eichromeurope@eichrom.com.

EICHROM USERS' GROUP MEETING, BRATISLAVA - SLOVAKIA

10th November, 2006

(Please fill in CAPITAL LETTERS)

LAST NAME : .....

FIRST NAME : .....

COMPANY/ORGANISM : .....

ADDRESS : .....

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POSTAL CODE : ..... CITY : ..... COUNTRY : .....

Ph.: ..... Fax : ..... e-mail : .....

I intend to present a subject entitled : .....

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I will be accompanied by : .....

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Signature ..... Date .....

For the lunch, please indicate any special requirement (vegetarian, food allergies...) : ....

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DEADLINES :
Registration and abstract submission : **25th September 2006**
Presentation submission : **9th October 2006**