TRISKEM INFOS

N°19
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Contents

Dear Customers,

First of all, we hope that you are well and in good health. We are all living uncertain times and the impacts of this sanitary crisis as well as the constraints of the next months are difficult to anticipate.

Nevertheless we would like to assure you that everybody at Triskem is fine and working, either at our facility or from home. Our main concern is to ensure the safety of our team and to meet your requests.

This unusual time showed us that we are able to provide high quality service and products even under difficult circumstances. Nevertheless it underlined also our dependence on the supply chain of our raw materials and the transport of our final products. It showed us the importance of the management and control of our processes. We manage the raw materials by increasing our stock in house, but we have only limited impact on the transport of our products, although we are using an internationally known carrier service.

We are trying to overcome the transport issues by working on the forecast of each of our customers to ensure that you will not suffer from any stock shortage. Please do not hesitate to contact us if you have any special requirements.

During the confinement our R&D has particularly focused on supporting our radio pharmaceutical customers and we are very pleased to present a part of our research for the separation of Lu-177 n.c.a. from large Yb targets in this newsletter.

If you wish to receive any additional information concerning this or other R&D projects, please do not hesitate to get in touch with Dr. Steffen Happel, our partner and director of R&D and business development.

Michaela Langer, CEO

TK221 Resin

The TK221 Resin is based on a mixture of a diglocylamide and a phosphine oxide. It further contains a small amount of a long-chained alcohol and the organic phase is impregnated onto an inert support containing aromatic groups for increased stability against radiolysis.

Graphs 1 – 11 show the selectivity of the TK221 Resin for a wide range of elements in HNO_3 (fig. 1 – 5) and HCl (fig. 6 – 11). All D_w shown in these graphs were obtained through ICP-MS measurements.

Out of the tested elements only Ca is weakly retained on the TK221 Resin in HNO_3. Other alkaline, earth-alkaline elements and Al are not retained.

Y and Sc are very strongly retained from HNO_3 of elevated concentration.

Fe(III) is also well retained at HNO_3 concentration ≥ 3M HNO_3.

A wide range of transition metals such as Zn, Ga, Co, Ni and Cu are not retained from nitric acid.

The TK221 Resin generally retains tetravalent elements such as Zr and Hf at elevated HNO_3 concentrations.

The TK221 Resin shows very high retention of lanthanides at HNO_3 concentrations ≥ 0.1M HNO_3, heavy lanthanides are even well retained in more dilute HNO_3 (≥ 0.01M). The retention of the lanthanides is significantly stronger than on TRU Resin.

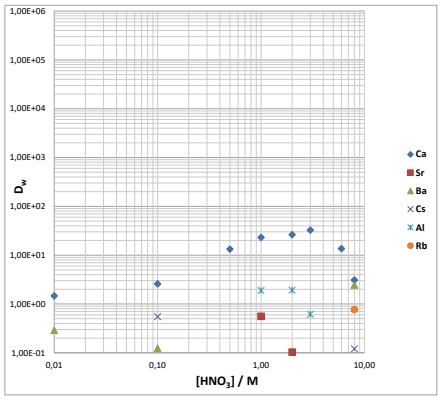

Figure 1: D_w values of selected elements on TK221 in HNO_3

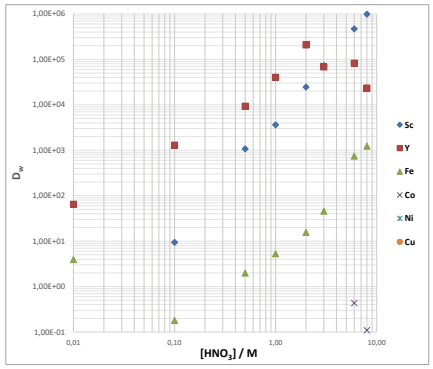

Figure 2: D_w values of selected elements on TK221 in HNO_3

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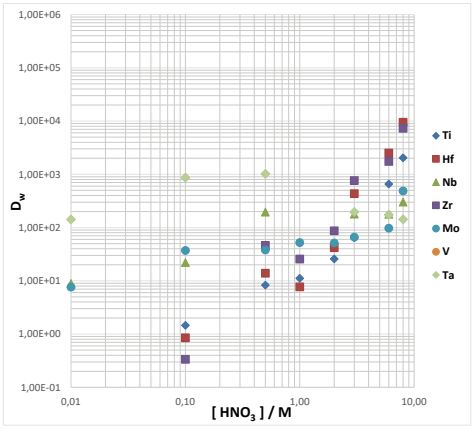


Figure 3: D_w values of selected elements on TK221 in HNO_3

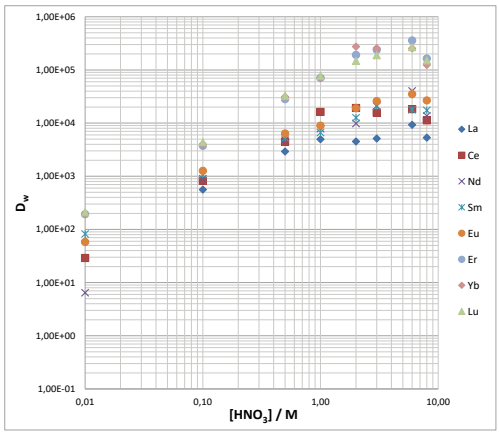


Figure 4: D_w values of selected elements on TK221 in HNO_3

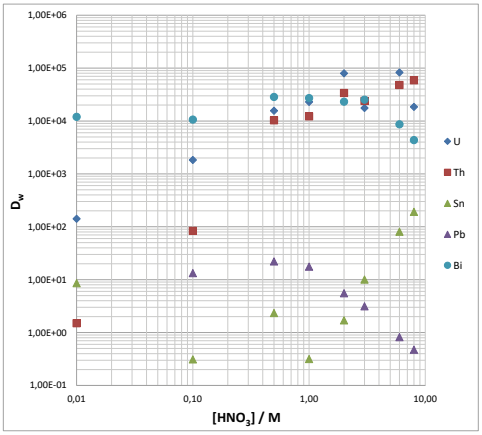


Figure 5: D_w values of selected elements on TK221 in HNO_3

News

You'll find an updated versions of our TechDocs and Flyers online on our website: https://www.triskem-international.com/technical-documents.php.

New Step-by-Step video tutorial explaining the use of our new 4 position vacuum box available on our youtube channel!

U and especially Bi are well retained over the whole HNO_3 concentration range, while Th is well retained at HNO_3 > 0.1M.

U retention is significantly higher than on other diglycolamide based resins such as DGA Resin. Pb and Sn are only weakly retained.

In HCl medium, none of the tested alkaline and earth-alkaline elements were retained on the TK221 Resin the same is true for Al.

Y and Sc are very strongly retained from HCl at elevated concentration (≥ 2M HCl). Fe(III) is also well retained at HCl concentration ≥ 3M.

Elements with a valency of +IV and higher such as Nb, Zr, Hf and Mo are very well retained at elevated HCl concentrations.

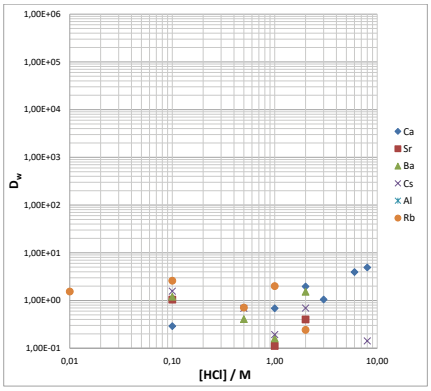


Figure 6: D_w values of selected elements on TK221 in HCl

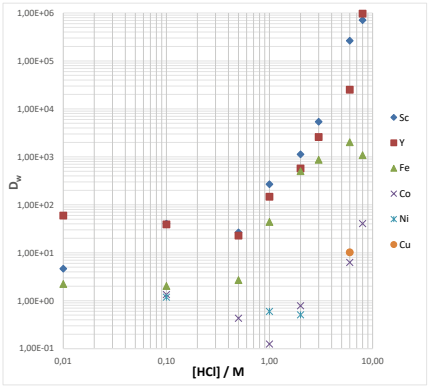


Figure 7: D_w values of selected elements on TK221 in HCl

Other than many other transition metals, Zn and Ga are very well retained from ≥ 2M HCl. Both may be easily eluted in dilute HCl.

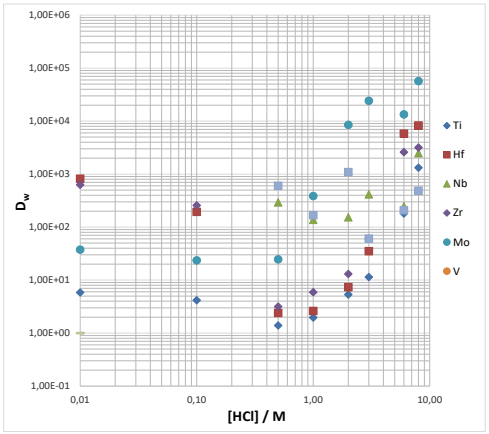


Figure 8: D_w values of selected elements on TK221 in HCl

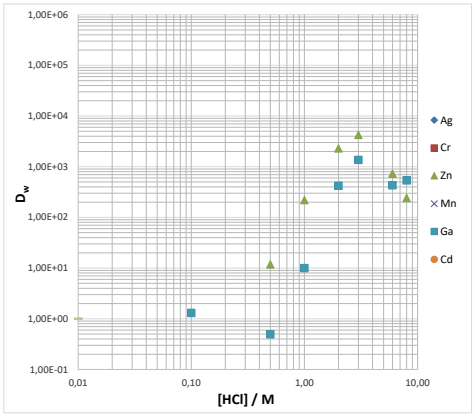


Figure 9: D_w values of selected elements on TK221 in HCl

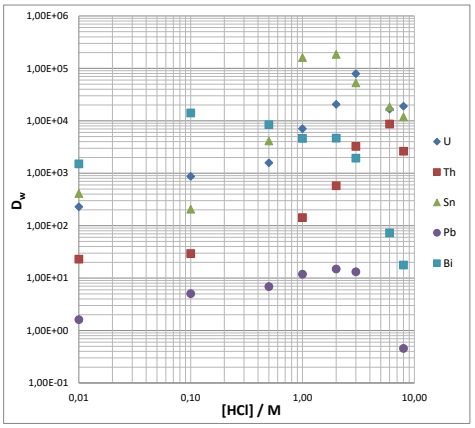


Figure 10: D_w values of selected elements on TK221 in HCl

U, Sn and Bi are well retained over the whole HCl concentration range, while Th is only well retained at ≥ 3M HCl. Pb is generally only very weakly retained.

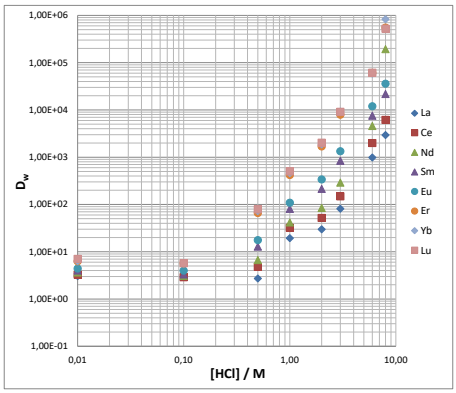


Figure 11: Dw values of selected elements on TK221 Resin in HCl

Lanthanides are generally very well retained at HCl concentrations ≥ 3M HCl, heavy lanthanides even at ≥ 1M, and they may be eluted in dilute HCl.

One of the main applications of TK221 Resin is the concentration, purification and conversion of heavy lanthanides such as Lu from highly acidic solutions into dilute HCl (typically ~0.05M HCl) conditions.

It allows e.g. to elute Lu in a smaller volume than DGA,N Resin. Accordingly, it may e.g. find use in the production of Lu-177.

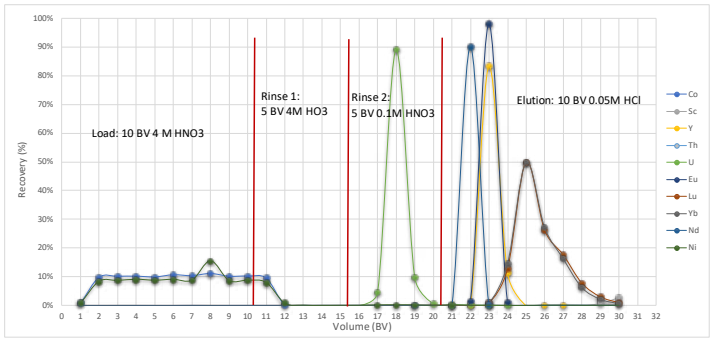


Figure 13: Elution study, various elements on DGA, normal Resin

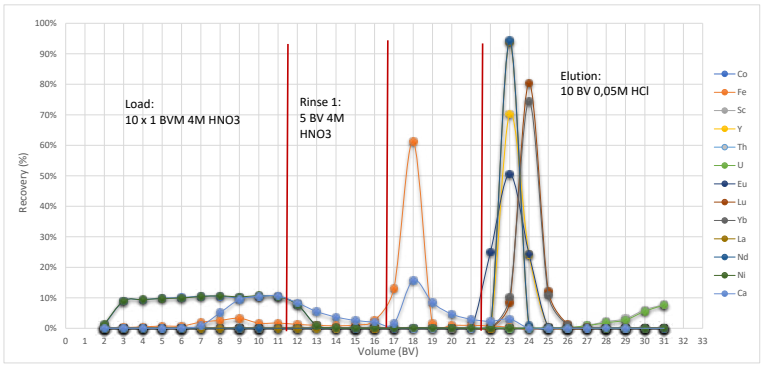


Figure 12: Elution study, various elements on TK221 (1)

A number of separation methods based on the TK221 Resin are currently being developed particularly for ca and nca Lu-177 purification, as well as the use of TK221 as part of the separation of nca Lu-177 from up to 500 mg Yb-176.

The final product obtained using the TK221 Resin is typically additionally passed through a 1 mL A8 cartridge for trace nitrate removal.

Such a separation should also be applicable to the purification of Ac-225.

The fact that the TK221 Resin is showing higher U retention compared to e.g. DGA,N Resin might further allow for its use in a two column separation method for sequential actinides separation.

Agenda

Please find here below a listing of the conferences at which we'll participate this year. The majority of the conference, we had planned to attend, have been postponed for security reasons. We understand and support these measures.

You'll find an updated list with the new conference dates (if known) on our web site under:

https://www.triskem-international.com/ma/events.

We will participate, for the very first time in two conferences with a virtual booth (SNMMI and EANM). Please don't hesitate to contact Dr. Steffen HAPPEL (shappel@triskem.fr) to organize a video conference or chat during these events. An overview over some recent work in the separation of radionuclides for use in nuclear medicine and radiopharmacy can be found in the "Presentations" section of our website (https://www.triskem-international.com/posters-and-presentations.php).

Meet us here:

- SNMMI, virtual booth, 11 – 14/07/2020, **https://am.snmmi.org/iMIS/SNMMI-AM**
- Procorad, 23 – 25/09/2020, Paris (France), **http://www.procorad.org/**
- EANM, virtual booth, 17 – 21/10/2020, Vienna (Austria), **https://eanm20.eanm.org/**
- WNE, 08 – 10/12/2020, Paris-Villepinte (France), **https://www.world-nuclear-exhibition.com/en-gb.html**

You'll find an update on our participations to conferences on our website : ***www.triskem.com***

Fig. 14 shows an elution study of various elements including U on TK221.

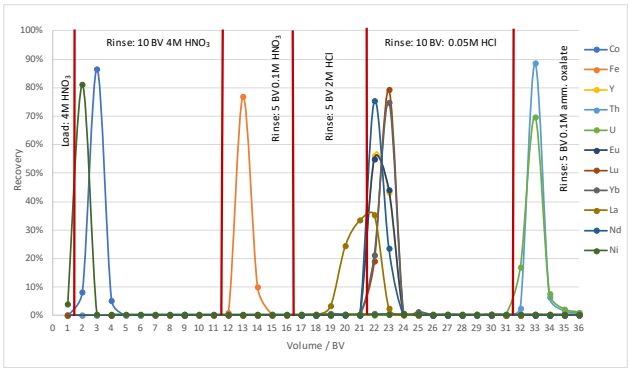


Figure 14: Elution study, various elements on TK221

U is very well retained under all employed HNO_3 and HCl concentrations and may finally be eluted in 0.1M oxalate. Am is expected to be eluted before U in dilute HCl.

With respect to the TK221 selectivity a stacked TEVA/TK221 method for the separation of U, Th, Pu, Am/Cm and Np seems very well possible.

In such a case Np(IV), Pu(IV) and Th(IV) would be retained, and separated, on TEVA while U and Am would pass through TEVA onto TK221 where both would be retained. It should then be possible to first elute Am with dilute HCl and finally U with dilute oxalic acid. The development of such a method is currently on-going.

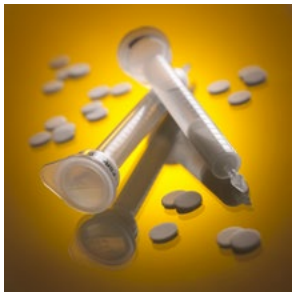
Main applications:

- Separation and concentration of lanthanides (e.g. ca and nca Lu-177)
- Separation of actinides
- Séparation of actinium

Bibliography:

(1) S. Happel: "An overview over some new extraction chromatographic resins and their application in radiopharmacy" presented on the 4th of June 2019 at the 102nd Canadian Chemistry Conference and Exhibition (CCCE 2019) in Quebec City, QC



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