TRISKEM INFOS

N°25
05/2025

SUMMARY

Edito :

Dear Customers,

We are pleased to share recent updates about improvements in our processes and products. These changes reflect our efforts to enhance quality and efficiency while meeting your expectations.

We are happy to announce the integration of an **automated cartridge filling machine** into our manufacturing process. The machine has been engineered to reduce operator involvement, thereby minimizing physical strain and human error. Furthermore, it ensures consistent filling quality and significantly lowers the risk of microbial contamination (bioburden), which is a crucial factor in maintaining product integrity and compliance with stringent quality standards.

Another important advance is the **introduction of expiry dates** of our products. This addition is grounded in principles of product lifecycle management and ensures adherence to regulatory requirements. The inclusion of expiry dates provides end-users with clear information about the product's usable timeframe, enhancing both safety and reliability in application.

We are also developing new **extractive discs**. We are presenting the TK-GrossAlpha Disc for direct alpha spectrometry of aqueous samples, the TK100 Discs e.g. for passive sampling of Sr and Pb, and the TK201 Discs for Tc-99 preconcentration e.g. from wastewater. More discs are under development. We further have three new resins in the pipeline (TK227, TK250 and SE Resin). Our aim is to meet your specific application requirements and to improve the efficiency of your extraction processes.

These innovations reflect our commitment to applying scientific rigor and technological progress to address operational challenges and provide new products. Please contact us for further information or if you have specific requirements.

We look also forward to meeting you at one of the upcoming conferences.

New cartridge packaging equipment

To optimize cartridge filling, ensure the high quality of the packing, and to reduce any potential risks, Triskem has decided to move from semimanual cartridge filling to a new, fully automized cartridge filling machine. The equipment has been installed in our production facility and is currently undergoing validation. It will find use in the packing of our standard 1 and 2 mL cartridges.

We also took into account that the glued labels or ink printed labels may represent a potential source of bio burden. Therefore, we replaced these labels by laser printing.

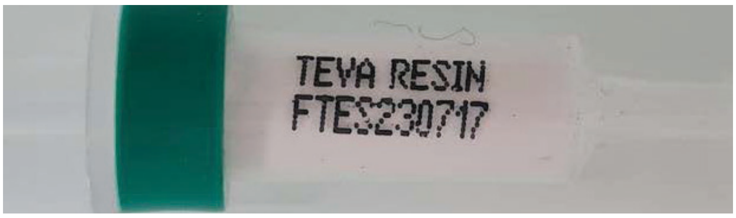
A consequence of the integration of the laser printer is that you will find the lot number now on the cap of the cartridges instaed of the cartridge body. We apologize for any possible inconvenience which might be caused by this change. Due to less space for the printing only the lot number will be printed on the cartridge caps. It should be noted that this lot number contains several important information:

"F" for French production, the following two letters indicate the resin e.g. "TE" for TEVA Resin, followed by the particle size here "S" for s grade resin (50 – 100 µm) and finally the production date of the resin in the format: YYMMDD, resulting (in this example) in FTES230717.

For the 'TK' Resins the "F" is eliminated and the lot number is given as e.g. TK200S240130.

Please do not hesitate to contact us for further information or if you wish to obtain a sample.

Up to now :



With the new filling machine :

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TK-SrScint Resin

The TK-SrScint Resin is a resin based on "Impregnated Plastic Scintillation microspheres" developed by Tarancón, and Bagán at the University of Barcelona [1-5].

These new materials consist of plastic scintillation microspheres (PSm), supplied by the group at the University of Barcelona, which are impregnated with selective extractants. The TK-SrScint Resin is designed for use in similar separation methods to those employing SR or TK102 Resins. The selective extractant used in the production of this PS resin is a crown ether (also used in SR Resin) dissolved in a fluorinated alcohol (used in TK102 Resin). Consequently, its selectivity will generally be very similar to that of the aforementioned resins, which are primarily used for Sr or Pb separations.

Figure 1 shows an SEM picture of the impregnated microspheres (TK-SrScint).

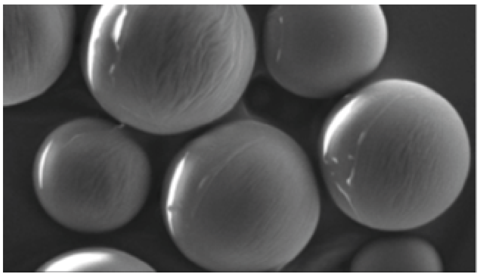


Figure 1: impregnated PSm (TK-SrScint). Taken from [4].

The TK-SrScint is available as pre-packed 2 mL cartridges for use with vacuum box systems or systems that can be easily automated using pump systems[1, 5].
As with the also available TK-TcScint Resin, the PSm support acts as a scintillating medium, allowing for direct measurement of the isotope retained on the cartridge.
Thus, there is no need to elute the target radionuclide and mix the eluate (i.e. radioactive solution) with a liquid scintillation cocktail (i.e. organic product). Incorporating this PS resin thus helps to reduce the amount of mixed (radioactive + organic) waste generated during the determination procedure.

This has a number of advantages :
- Less hands-on time consumed which is particularly interesting in emergency situations ;
- No mixed liquid radioactive waste ;
- No Sr, Pb or Ba elution required and no evaporation / sample preparation of the eluate ;
- No cutting of columns or cartridges to push the resin into LSC vials.

Especially the latter two points are interesting in terms of radiation protection when samples of elevated activity are being analyzed. Ideally the chemical yield is determined via ICP-MS or ICP-OES using Sr as internal standard (comparison between the initial amount added and the strontium not retained on the PS Resin).

Figure 2 compares this new approach based on impregnated PSm Resins such as the TK-TcScint with classical methods.

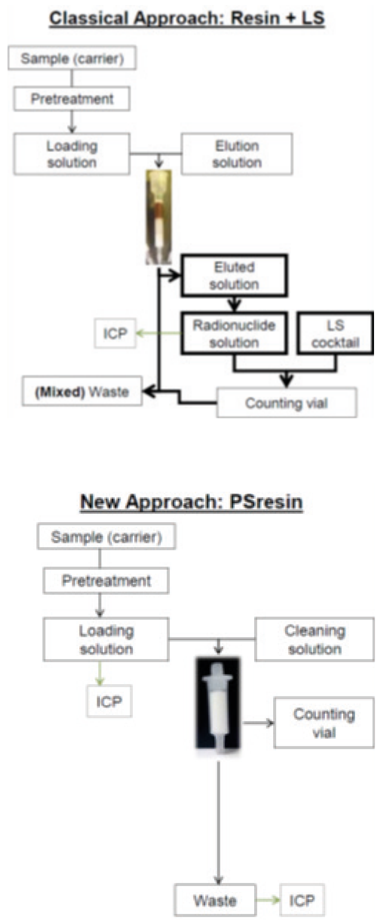


Figure 2 : Overview classical radioanalytical method and PS Resin approach. Taken from [5]

In order to easily handle and avoid contaminating the LSC counter the cartridges should be placed in a standard 20 mL LSC vial for its measurement. The TK-SrScint Resin has been tested in various water samples, including river, MAPEP, and CSN interlaboratory samples. Results were compared with the two most common methods for Sr-90 determination: extraction chromatography using SR Resin combined with LSC, and successive precipitations combined with LSC. Sr-90 activity evaluated using the different methods ranged from 0.49-4.9 Bq/L in spiked river water samples, to 5.65-10.48 Bq/L in MAPEP interlaboratory samples, and 4.1 Bq/L in CSN interlaboratory samples. Moreover, in CSN samples, interferences such as Co-57, Co-60, Cs-134, Pu-238, Ra-226, Pb-210, and Ra-228 were evaluated.

Prior to applying the PS method using TK-SrScint Resin, various precipitation methods to remove Pb from the sample were investigated. Iodate precipitation was selected as the most suitable method for Pb removal, and further optimization was performed to increase Sr recovery while decreasing Pb presence (~3% remaining). The final procedure included precipitating Pb by adding iodate and calcium as coprecipitating agents and boiling of the sample. Once Pb was removed, Sr was precipitated using hydrogen phosphate in a basic medium, and the resulting precipitate was dissolved with 8 M HNO_3 for loading the sample onto the TK-SrScint Resin.

After analyzing water samples spiked with CSN, Sr chemical yields of approximately 87% were achieved. The analysis considered a background signal of 0.18 CPM, and no other radionuclides, including Pb-210, were detected in the samples. For larger samples, such as 1 L spiked river water samples, a carbonate precipitation step was added to reduce sample volume. In these cases reported chemical recoveries ranged between 63% and 81%[6].

Figure 3 shows the LS spectra of the target radionuclide (Sr-90) and the potential interference (Pb-210) at different times to account for Y-90 ingrowth.

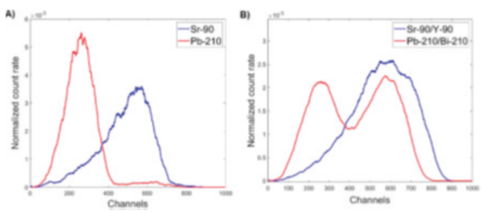


Figure 3: Liquid Scintillation normalized Spectra of Sr-90/Y-90 (blue) and Pb-210/Bi-210 (red) on TKSrScint at time 0 (A) and with ingrowth daughters at time >21 days (B). Taken from [6].

TK-SrScint Resin

The detection efficiency of Sr-90, evaluated at time 0, was found to range between 86% and 51% for complete and optimal window settings, respectively. The optimal window was selected to minimize the possible contribution of Pb-210 to the LS spectrum. A lower background signal of 0.3 CPM, compared to standard methods, was achieved with TK-SrScint resin, resulting in a lower detection limit of 27 mBq/L (1 h counting time).

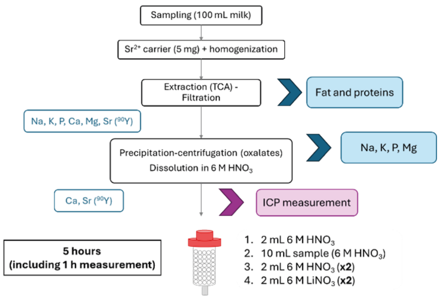


Figure 4: Sr-90 determination procedure in milk samples. Taken from[7].

As mentioned earlier, the inclusion of PS Resin in the Sr-90 determination method reduced the procedural turnaround time to 5-6 hours.

According to the results obtained by Tarancón et al. (2024) [7] when testing IAEA milk powder samples, the Sr-90 activity quantified using the TKSrScint Resin was in agreement with the reference activity. Moreover, interferences such as Ca, Na, and K were shown to be removed by observing a clear Sr-90/Y-90 spectrum and through measurements taken with ICP.

• *Bibliography*

(1) Coma et al. "Automated separation of 99Tc using plastic scintillation resin PSresin and openview automated modular separation system (OPENVIEW-AMSS)", Journal of Radioanalytical and Nuclear Chemistry (2019) 321:1057–1065.https://doi.org/10.1007/s10967-019-06659-7

(2) Barrera et al. "A new plastic scintillation resin for single-step separation, concentration and measurement of technetium-99" Analytica Chimica Acta 936 (2016) 259-266. https://doi.org/10.1016/j.aca.2016.07.008

(3) Tarancón et al. "A new plastic scintillation resin for single-step separation, concentration and measurement of 99Tc", presented at the NRC9 (29/08/16 – 2/09/16, Helsinki, Finland)

(4) Hidex eBook "Liquid Scintillation Measuring Procedures: New Developments" https://hidex.com/ebooks/liquid-scintillationmeasuring-procedures/measuringprocedures/ radionuclides-from-nuclearfission- activities/2-3-14-tc-by rad-disk-andpsresins/

(5) J. Garcia & A. Tarancon, "Radionuclide determinations with PS Resin MASS WaterRadd", presented at the European Users Group Meeting in Cambridge (UK) - 21/09/2018, https://www.triskeminternational.com/scripts/files/5bae2550c30ed4.50583030/11_j-garcia_atarancon_radionuclide-determinations-withps-resin_mass_waterradd.pdf

(6) Giménez et al. "A new method based on selective fluorescent polymers (PSresin) for 3 the analysis of 90Sr in presence of 210Pb in environmental samples" Applied Radiation and Isotopes, 199, 2023, https://doi.org/10.1016/j.apradiso.2023.110879

(7) Tarancón et al. "Recent applications of Plastic Scintillation Resins », presented at Raddec-Triskem Workshop 2024, (18/04/24, Portsmouth, UK)

Agenda

TrisKem will be participating to the following upcoming conferences and is very much looking forward to meeting and discussing with you there!

•Congres XXX ALASBIMN & XIII FMMNIM, 13/03 – 16/03/2025, Cancun (Mexico) *https://alasbimnmexico2025.com/*

•Conference 180°N, 31/03 – 02/04/2025, Oslo (Norway) *https://www.180nconference.no/*

•26th International Symposium on Radiopharmaceutical Sciences (iSRS 2025), Goldcoast (Australia), 11/05 – 16/05/2025 *https://www.srsweb.org/isrs2025-home*

•24th International Conference on Radionuclide Metrology and its applications (ICRM 2025) , Paris (France), 19/05 – 23/05/2025 *https://icrm2025.org/*

•Congreso SEMNIM XLI, Valladolid (Spain), 21/05 – 23/05/2025 *https://semnim.es/congreso/congreso-semnim-xli-valladolid/*

•55th Annual Scientific Meeting of the Australian and New Zealand Society of Nuclear Medicine (ANZSNM), 23/05 – 25/05/2025, Melbourne (Australia) *https://www.anzsnm.org.au/eventdetails/27648/anzsnm-55th-annual-scientific-meeting*

•11. RCA-Workshop, 03/06 – 05/06/2025, Dresden- Rossendorf (Germany) *https://www.vkta.de/veranstaltungen/11-rca-workshop-vom-03-05-juni-2025-in-dresden-rossendorf/*

•Canadian Radiotheranostics Leaders' Summit 2025, 12/06 – 13/06.2025, Toronto (Canada) *https://www.canadianisotopes.ca/2025-leaders-summit/*

•2025 SNMMI Annual Meeting, 21/06 – 24/06/2025, New Orleans (USA) *https://snmmi.org/AM/AM/Home.aspx*

•Conference Goldschmidt 2025, 06/07 – 11/07/2025, Prag (Czech Republic) *https://conf.goldschmidt.info/goldschmidt/2025/meetingapp.cgi*

You'll find a n update o n o ur participations to conferences on our website : *https://www.triskem-international.com/ma/events*

CU iSheets

CU iSheets are comprised of iTLC-SG TLC (Thin Layer Chromatography) paper (Agilent) impregnated with the same Cu selective extractant that is also employed in the CU Resin.

TLC papers are frequently used in the quality control (determination of radiochemical purity) of labeled compounds for use in radiopharmacy. In some cases, for example when analyzing Cu-labelled peptides, artefacts can form during such a TLC test when using silica gel based supports. These artefacts can then interfere with the analysis of TLC scans by creating or distorting peaks. While switching to non-silica based TLC supports (e.g. Whatman paper) generally leads to an improvement, this comes with the disadvantage of significantly longer development times and broad peaks.

Svedjehed and Gagnon [1] could show that using CU Sheets a significantly better resolution with short development times can be obtained for Cu labelled peptides.

The authors produced ^{61}Cu via the ^{nat}Ni(d,x)^{61}Cu reaction using a GE PETtrace solid target system and purified the [^{61}Cu]$CuCl_2$ using a TBP/TK201 Resin based method as described previously [2].

Aliquots of [^{61}Cu]$CuCl_2$ were then incubated (90°C; 30 min; pH 4.4 [0.3 M acetate buffer]) with varying low concentrations of NOTA-octreotide trifluoroacetate or NODAGA-RGD trifluoroacetate (ABX). In all cases the ligand concentration was kept below excess to ensure incomplete labelling and thus presence of non-labeled ^{61}Cu.

5µL of the respective ^{61}Cu-labelled peptide were then spotted with origin at 1cm onto strips of 10cm length of: a.) iTLC-SG, b.) Whatman paper (both non-impregnated) and c.) CU iSheets, and developed to at least 7cm in 1:1 MeOH/1 M ammonium acetate.

Fig. 1 shows the result of TLC scans of [^{61}Cu]Cu-NOTA-octreotide with elevated levels of free ^{61}Cu (example 1) and [^{61}Cu]Cu-NOTA-octreotide scans at comparable levels of labelled and unlabelled ^{61}Cu (example 2). The authors reported that similar results were obtained in case of [^{61}Cu]Cu-NODAGA-RGD.

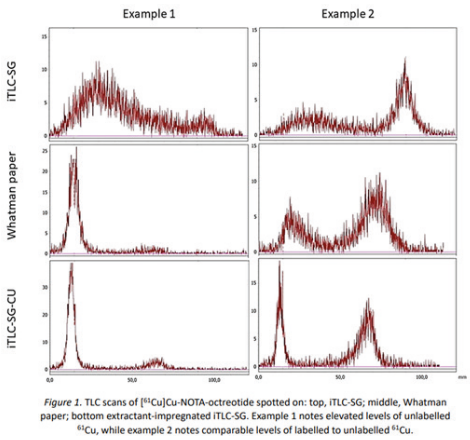


Figure 1: TLC scans of [^{61}Cu]Cu-NOTA-octreotide spotted on: top, iTLC-SG; middle, Whatman paper; bottom, CU iSheets. Example 1 notes elevated levels of unlabelled ^{61}Cu, while example 2 notes comparable levels of labelled to unlabelled ^{61}Cu. Taken from [1]

The scans show that in this case using non-impregnated iTLC-SG and Whatman papers results in wide, non-uniform peaks of low resolution. TLC scans using CU iSheets show significantly sharper, separated peaks with the added benefit of short development time compared to the Whatman paper (<10 min instead of ~25-30 min for the Whatman paper). The authors report even greater differences when decreasing the amount of peptide.

- Bibliography

[1] J. Svedjehed et al.: "New extractant impregnated iTLC-SG paper facilitates improved TLC analysis for Cu radiolabelled peptides", poster presented at TERACHEM 2022, 14 – 17 September 2022, Bressanone (Italy). Poster available online on our website.

[2] J. Svedjehed, K. Gagnon. A quest for simplicity: Automated cassette-based purification of [^{61}Cu]$CuCl_2$ from solid Ni targets using a single time-list. Nucl Med Biol, 108-109, S1 (2022), P-220, ppS170.

News

- **Expiry Date**

Following an increasing number of requests we have decided to start implementing an 'expiry date' instead of a guaranty for our products. We will first implement the expiry dates on the Certificates of Analysis, and later it will also be noted on the labels of our products.

We will send out more detailed information about this change very soon, in the meantime please don't hesitate to contact us for more information.

- **Bluesky**

As you might know, we have used our X (former Twitter) account to publish links to papers employing extraction chromatography materials that we think might be of interest for you, our users.

We have decided for various reasons to step away from using X. While we'll keep the account open (to allow checking previous shares of links to papers) we have stopped updating it. Instead, we will continue sharing these links on our new Bluesky account now. You'll still also find links to a number of publications on our website.

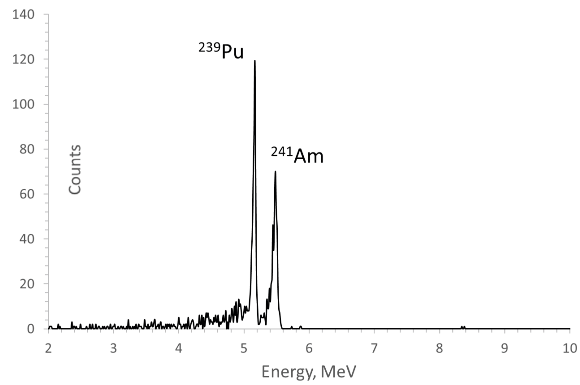
Coming soon :

Extractive Discs

TRISKEM
Expertise in Separation Chemistry

- Range of selective impregnated membrane filters
- Ø = 25mm and 47mm Discs will be available
- Various extractant systems (TK100, TK201, GrossAlpha, CU,...) in beta-testing
- More Discs under development
- For use in filtration or passive sampling set-ups

Use of **TK-GrossAlpha Discs** for direct alpha spectrometry of aqueous samples



Alpha spectrum, 25mm TK-GrossAlpha Disc, 20 mL HNO_3 at pH2 spiked with 30 mBq each Am-241 and Pu-239

Disc preparation

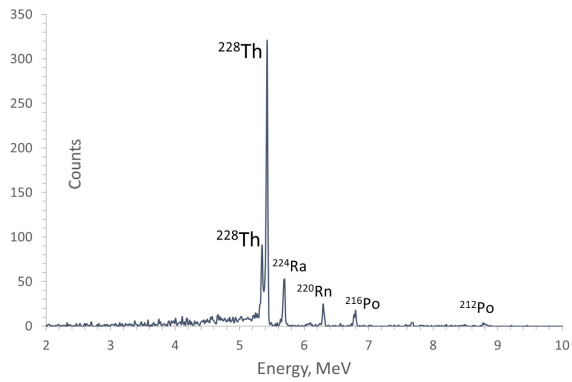
Sample filtration (at pH 1 – 2)

Drying of the disc

Glueing on a rigid support

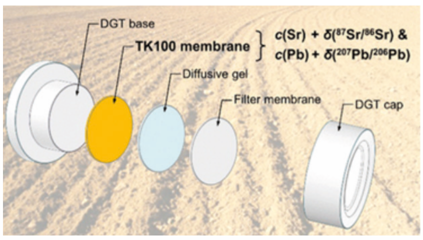
↓

Alpha spectrometry measurement



Alpha Spectrum, 47mm TK-GrossAlpha Disc, 100 mL Pedras mineral water at pH 1

TK100 Discs for passive sampling in soils



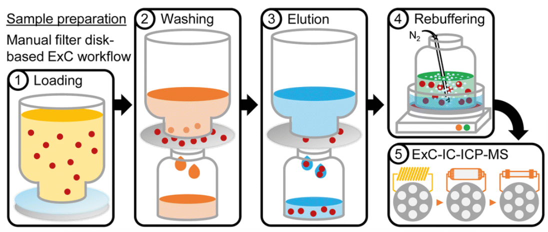
DGT set-up using TK100 Discs for Sr and Pb capture

« Selective Diffusive Gradients in Thin Films (DGT) for the Simultaneous Assessment of Labile Sr and Pb Concentrations and Isotope Ratios in Soils »

Anal. Chem. 2022, 94, 6338–6346

Stefan Wagner, Jakob Santner, Johanna Irrgeher, Markus Puschenreiter, Steffen Happel, and Thomas Prohaska

TK201 Discs for Tc-99 preconcentration from waste water



Experimental setup, Tc-99 concentration and purification from waste water using TK201 discs for preconcentration

« Quantification of technetium-99 in wastewater by means of automated on-line extraction chromatography – anion-exchange chromatography – inductively coupled plasma-mass spectrometry »

J. Anal. At. Spectrom., 2024, 39, 2774-2782

Maximilian Horstmann, C. Derrick Quarles Jr, Steffen Happel, Michael Sperling, Andreas Faust, David Clases and Uwe Karst*

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