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Over the past six years, Eichrom has become one of the key suppliers of innovative products to the radioanalytical industry. The readers of this newsletter have been instrumental in helping us grow to this point. What many of you may not have been aware of is the growth of Eichrom in recent years in other fields. Our company has leveraged what we have learned from this industry to provide innovative solutions to other industries as well.

In the fourth quarter of 1995, we signed a multi-million dollar agreement to install our Iron Control System in a copper mine in northern Mexico. This system, based on Eichrom's Diphonix® Resin, removes iron impurities from the plant's solvent extraction/electrowinning (SX/EW) circuit. Installation of the system will be completed later this year.

In the spring of this year, Eichrom won two awards under the Department of Energy's Research Opportunity Announcement (ROA) and Program Research and Development Announcement (PRDA) programs. These awards, for the development of a silica-based Diphonix Resin and for the application of our ABEC technology to the treatment of technetium and iodine bearing alkaline waste, represent a three-year effort on Eichrom's part and nearly $2 million in support from DOE.

We continue to see success in the application of Diphonix Resin to the treatment of nuclear power plant rad-waste, the purification of acid solutions for semiconductor manufacturing, and the treatment of industrial effluents. The company is also pursuing new business opportunities in supplying innovative products for use in radiopharmaceutical manufacturing.

In every issue of *Eichrom Ideas* we try to keep you informed of new developments at Eichrom in the radioanalytical field. In this issue, I wanted to let you know of Eichrom news in other fields.

Scott Wallace
President

"We have leveraged what we have learned from this industry to provide innovative solutions to other industries such as mining, semiconductor manufacturing, radiopharmaceutical manufacturing and wastewater treatment."

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Did You KNOW...

...Eichrom supplies analytical grade cation and anion exchange resins which are technically comparable to Bio-Rad's AG® resins? If you currently buy from Bio-Rad®, you could save money buying from Eichrom. Call today for pricing.

...Beryllium can be separated from Mo(VI), Zr, Th, U(VI), Fe and Tl(III) using Eichrom's TEVA Resin? Call today for a copy of a paper outlining this interesting procedure.

...Eichrom manufactures a Nickel Resin which is based on the traditional DMG precipitation? In a column form, the procedure is much easier to perform. Since the chemistry is identical to the traditional method, it is easily implemented and approved. See the article on Ni Resin in this issue of *Ideas*.

Hurry!

Register Now for Eichrom's Workshop at the Bioassay Conference

Eichrom Industries will hold its annual User's Workshop on Monday, October 14, 1996, from 1:00pm - 5:00pm, in the International Room at the Cathedral Hill Hotel, 1101 Van Ness Avenue, San Francisco, California during the 42nd Conference on Bioassay, Analytical and Environmental Radiochemistry.

The workshop will feature customer presentations of new applications, and new product and method developments using Eichrom's resins.

If you plan to attend, please fill out the form below and fax it back to us at (630) 963-1928. If you have further questions regarding Eichrom's workshop, please feel free to call Lynda Gates at (800) 422-6693 or (630) 963-0320.

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ e-mail _____

Nickel Resi

The introduction of Eichrom's Ni Resin last year (*Ideas*, vol. 2, no. 2, October 1995) was greeted by many of the nuclear power stations as an opportunity for a faster, easier means of measuring radioactive nickel content. The use of DMG as a selective precipitant for separation of Nickel isotopes has been documented widely and put into practice around the world. However, the Ni-DMG precipitate is difficult to handle and not easily separated from the supernatant. Because of this, a number of repetitions of the precipitation process are necessary to ensure complete separation from other, potentially interfering radionuclides in the sample.

Eichrom's Ni Resin utilizes DMG impregnated into the pores of an inert polymer support. In a method using Eichrom's Ni Resin, the Ni-DMG precipitate is formed and contained inside the pores of the resin. In this form, it is easily separated from the supernatant liquid. Only one pass through a column is necessary to achieve excellent decontamination factors.

In a past issue of *Eichrom Ideas* we described the method and presented method performance data generated by scientists at Carolina Power and Light. Recently additional experiments were conducted at Southampton Oceanography

Table 1: Effect of Ammonia Concentration on Ni Uptake

Ammonia Concentration	Mass of Ni Resin	Initial Ni-63 (Bq/10mL filtrate)	Final Ni-63 (Bq/10mL filtrate)	Distribution Coefficient
0.2%	0.1039	424	4.31	9590
0.5%	0.0959	442	4.87	9464
1.0%	0.0962	440	5.08	9020
5.0%	0.1032	440	15.10	2736
10.0%	0.1063	449	28.40	1391

Centre in the United Kingdom. Mr. P. E. Warwick and Dr. I. W. Croudace examined the effect of varying the concentration of ammonia solution on the uptake of Ni on the column (as measured by distribution coefficient between the column and the aqueous sample). These results are presented in Table 1.

They also measured the distribution coefficients of a number of other radionuclides found in typical nuclear power plant samples. These values are listed in Table 2. Of the elements listed, only Ni shows a strongly affinity for the DMG loaded onto the column.

Figure 1 is an elution curve showing the strong uptake of nickel on Eichrom's Ni Resin. Up to 150 mL of rinse solution were passed through a standard 2 mL Ni Resin column without breakthrough of nickel. Two 5mL fractions of 1M nitric acid quantitatively removed Ni from the column.

We are pleased to report on this additional evaluation of the Ni Resin column by the group at Southampton. We hope this data will encourage you to switch from DMG precipitation methods to Eichrom's Ni Resin Column.

Table 2: Distribution Coefficients For Nickel Resin from 1% Ammonia (buffered with citric acid)

Radionuclide	*Form*	*Distribution Coefficient*
Am-241	Am(III)	2.2
Ba-133	Ba(II)	2.3
Cd-109	Cd(II)	<1.0
Ce-139	Ce(IV)	<1.0
Co-57	Co(II)	4.1
Co-60	Co(II)	3.9
Cs-137	Cs(I)	<1.0
Eu-155	Eu(II)	11.2
Gd-153	Gd(III)	3.0
Mn-54	Mn(II)	3.3
Na-22	Na(I)	5.0
Ni-63	**Ni(II)**	**9020**
Sn-113	Sn(IV)	6.4
Sr-85	Sr(II)	<1.0
Y-88	Y(III)	4.2
Zn-65	Zn(II)	<1.0

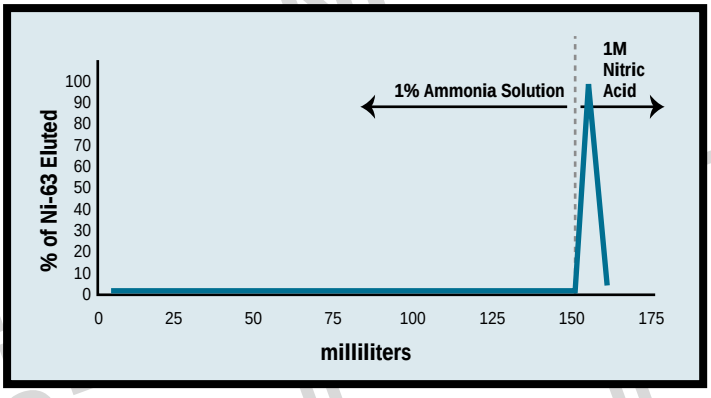


Figure 1: Elution of Ni-63 from Nickel Resin

Frequently Asked QUESTIONS

...About Eichrom Resins & Pre-packed Columns

1 Extruding resin from columns is described in several papers. How is this done?

This is called for in our procedure for Tc using TEVA Resin, but has also been used in procedures for Sr and Pb using the Sr Resin.

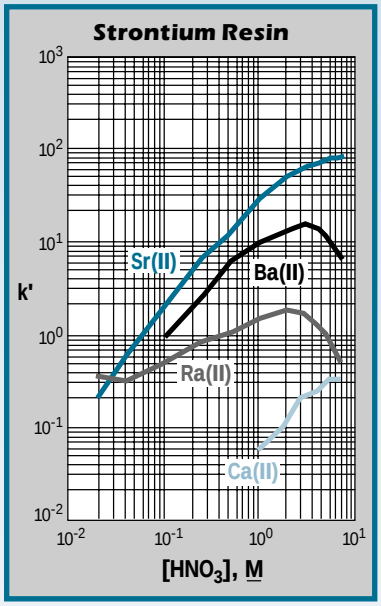
Transfer the resin into a liquid scintillation vial by removing the top column frit. Attach a syringe with appropriately sized tubing to the column tip and wash the resin from the column with 3 mL of 0.01M HNO_3.

Alternatively, after removal of the top frit, the column can be cut near the bottom frit with a razor blade and the resin rinsed out with three 1 mL aliquots of 0.01M HNO_3.

2 Can I effectively separate barium from strontium using Sr Resin?

Yes. Using 8M HNO_3 to load the sample and another 8M HNO_3 rinse (approximately 15mL) will allow a good separation between Sr and Ba. At 8M nitric acid, the separation factor between Sr and Ba is maximized (see figure 1).

Figure 1: Acid Dependency of k′ for Various Ions at 23-25°C



E. P. Horowitz, et al, *Solvent Extraction and Ion Exchange*, 10(2), 313–336 (1992).

3 Are there any reagents which should be avoided to prevent damage to the resins or the integrity of the resin bed?

Alcohols, and other organic solvents, can dissolve and strip the extractant from the column. These reagents should never be used to condition extraction chromatographic resins. In some cases it is desirable to strip the extractant from the column as a means of eluting the analyte. If so, isopropanol is a suitable stripping agent.

4 Does lead interfere with strontium on the Sr column?

Because Pb is retained much more strongly than is Sr, it usually will not break through into the Sr fraction if published methods are followed. A high amount of lead in a sample loaded onto a Sr Resin column could exhaust the column capacity and result in breakthrough of Sr in the load or rinse fractions. No studies have been conducted measuring the effect of lead content on Sr breakthrough, however, what is known about the Sr Resin characteristics indicates that a 2mL Sr Resin column should have adequate capacity to handle up to 10mg of lead in a sample. The presence of stable strontium in the sample will reduce the amount of lead the column can handle before strontium breakthrough.

5 If actinide elements are present in a sample will they interfere with the analysis of strontium using an Eichrom Sr Resin column?

Since Th, U and Am are not well retained on the Sr Resin, they are not likely to interfere in any way with Sr measurements. Pu and Np, however, are quite strongly retained under certain nitric acid conditions. The presence of oxalate in the sample load solution to complex Pu and Np, will prevent the absorption of these elements on the column and eliminate any contamination in the Sr fraction.

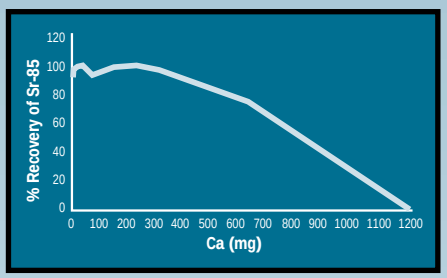


Figure 2: Calcium Matrix Effect on Chemical Recovery (2ml standard Sr Resin column)*

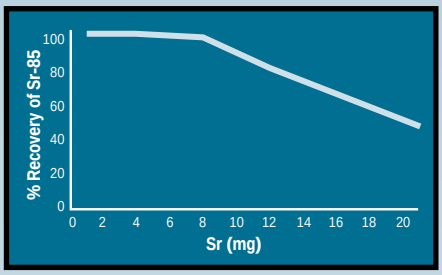


Figure 3: Strontium Matrix Effect on Chemical Recovery (2ml standard Sr Resin column)*

6 How much calcium can a Sr Resin column tolerate?

Figure 2 shows the matrix effect of increasing calcium content in a sample on the chemical recovery of Sr-85 tracer. No decrease in Sr-85 recovery was observed for a calcium content up to 320 mg per sample.

7 What is the capacity of Sr Resin?

The total, theoretical capacity of a 2mL prepacked Sr Resin column is approximately 18 mg. However, as capacity is consumed by strontium, the retention of Sr on the column is reduced. A practical working capacity is somewhat lower than the theoretical amount.

A more useful understanding of capacity can be obtained from figure 3, which shows the effect of strontium content on chemical recovery. Negligible effect was observed for strontium content up to 8 mg per 2mL Sr Resin column. Above this amount of strontium there is a gradual decrease in chemical recovery.

*Data supplied courtesy of Central Radiochemistry Laboratory, Magnox Electric, United Kingdom.

In this issue

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Announcements

Extraction Chromatography Course Scheduled for October—in Germany

Eichrom will participate in an extraction chromatography course organized by the Centre for Advanced Technological and Environmental Training at the Forschungszentrum Karlsruhe. The course is scheduled for three days (October 7 through October 9, 1996) and will be held on site at the Forschungszentrum in Karlsruhe, Germany. The language of instruction will be German. To obtain contact information for the course organizers, please contact Eichrom's European office in the United Kingdom at +44 (0) 1337 827 715.

New Area Code for Eichrom

Please note that our area code has changed. We can now be reached at: **630**/963-0320 (telephone); **630**/963-0381 (fax). Or in the U.S., you can still reach us at our toll-free number: 800/422-6693.

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