

# RadChem *Info*

In Brief

MnO<sub>2</sub> Resin

Agenda

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## eichrom

Expertise. Commitment. Results.

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## Editorial

We are happy to be in contact with you again! The users' group meeting brought to our attention that we need to publish more characterization data on the MnO<sub>2</sub> Resin in order for its full potential to be realized. We are also working on the application of Eichrom procedures to matrices other than water and for quantities greater than 10g.

Quality is a very important aspect for any company in any industry. Eichrom Technologies in the US has held ISO 9001 certification for more than 10 years. It is now one of Eichrom Europe's 2006 objectives to be ISO 9001 certified by the end of the year.

In this spirit, starting in April you'll be receiving a "Customer Satisfaction" questionnaire in your order parcels. This questionnaire should be returned by fax only in case you have observed a physical defect in the sent items.

Aude Bombard  
Product Manager  
Eichrom Europe



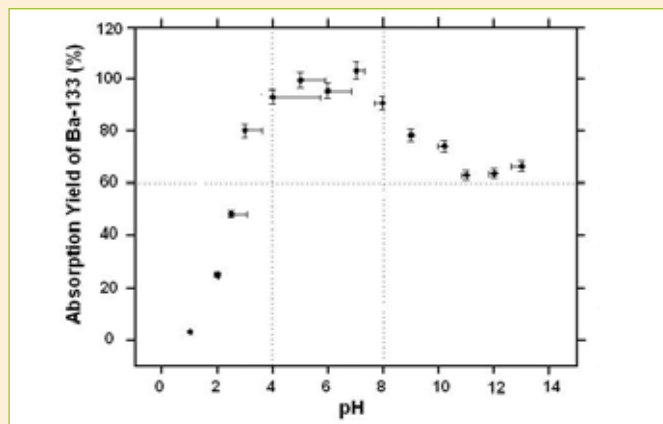
Document édité et imprimé  
sur du papier recyclé.

# Resins

## MnO<sub>2</sub> Resin : Another tool for Ra separation & measurement

MnO<sub>2</sub> Resin is one of the new products we launched in 2005. It's first application, the separation of Ra in water samples, was developed and published by Moon, et al.<sup>1</sup> The next few paragraphs highlight their work. Different parameters such as pH, reaction time, resin quantity, salt effect and flow rate have been evaluated when separating Ra from water using MnO<sub>2</sub>. For most of the experiments, Ba-133 was used as tracer for Ra.

According to figure 1, MnO<sub>2</sub> Resin shows the greatest affinity for Ba-133 when the pH of the solution is between 4 and 8.



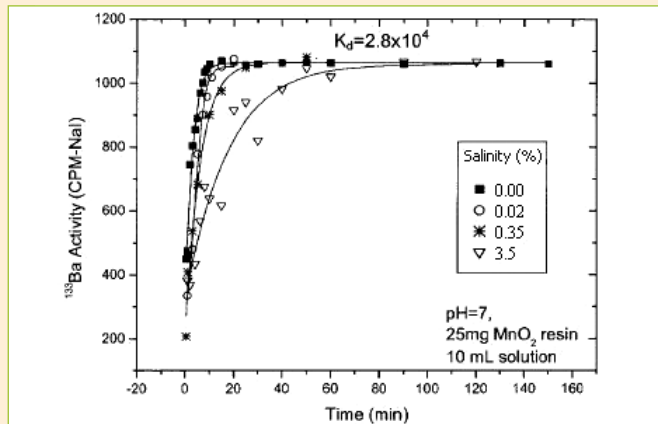
**Figure 1 :** nized water, 25 mg of resin, magnetic stirring for 60 minutes at 20° C, pH adjusted with HCl or NaOH. Measurement done with a NaI well-type detector.

The higher the salt content of the water, the slower the kinetics of Ba (or Ra) uptake. (figure 2). The equilibrium is reached after 15 minutes of contact for samples with a salt content between 0 and 0.02%, whereas 25 minutes are required when the water contains 0.35% salt. For waters which composition is similar to seawater (3.5% salts), the equilibrium is reached in 90 minutes.

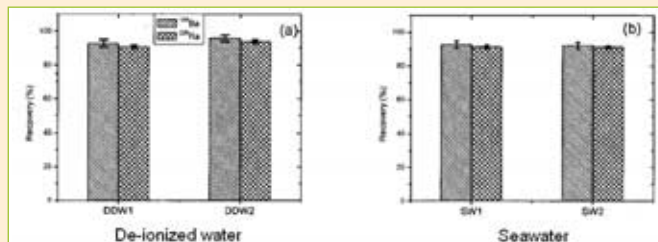
The batch uptake of radium and barium by the MnO<sub>2</sub> Resin from deionised water and seawater have been studied and found comparable. The data in Figure 3 indicates equivalent uptake by the resin under two conditions : 1 gram resin per liter of water and 2.5 gram resin per liter of water.

The recovery of Ba-133 and Ra-228 with respect to flow rate has been studied for 2 types of waters : deionised and artificial seawater. For salt water, the flow rate must not exceed 20mL/min, otherwise a loss in recovery of 30% may be observed. Additionally the chemical recoveries of Ba and Ra start to differ from each other, Ba-133 can thus no longer be considered as

a chemical homologue, making its use as an internal standard not appropriated.



**Figure 2 :** Absorption kinetics of Ba-133 with respect to the salinity of the water sample. 10 mL of water sample traced with Ba-133 with charges in salt of 0, 0.02%, 0.35% and 3.5%. 25 mg MnO<sub>2</sub> Resin are added to pH 7 solutions under magnetic stirring for different times.



**Figure 3 :** Absorption recovery of Ba-133 and Ra-228. Duplicate experiment on deionized and artificial seawater. 2.5g/L and 1g/L of MnO<sub>2</sub> Resin.

The MnO<sub>2</sub> Resin is currently used with LN Resin and DGA, Normal Resin in a method developed by Sherrod Maxwell<sup>2</sup> of Westinghouse Savannah River. It is used to pre-concentrate Ra from 1 to 1.5L water samples. 1.25 g/L of MnO<sub>2</sub> Resin is used per sample. The sample is initially stabilized at pH 6-7 and 25 mg Ca are added per liter. The sample is then loaded onto MnO<sub>2</sub> Resin with a flow rate of about 15 mL/min. Ra is eluted with 15mL 4M HCl/1.5% H<sub>2</sub>O<sub>2</sub>. The 15 mL solution are, left a minimum of 36 hours for Ac-228 ingrowth before being loaded onto 2 cartridges stacked on top of each other : LN Resin (retention of U and Th) and DGA, Normal Resin (retention of Ac-228). Ac-228 is eluted from DGA Resin with 10 mL 0.5M HCl, then micro-precipitated with CeF<sub>3</sub> on Resolve™ Filter. This method is currently under validation in our laboratory.

### Bibliography

- (1) Moon D.S., Burnett W.C., Nour S., Horwitz P., Bond A., *Applied Rad. Isot.*, **59**, 255 (2003).
- (2) Maxwell, S.L., presented at Eichrom's North American Users' Meeting, Oak Ridge, TN, May 3, 2005, see [www.eichrom.com](http://www.eichrom.com).

Do not hesitate to contact us for more details

# In Brief

## Eichrom Users' Group Meetings

The Users' Group Meetings organized last year brought different remarks/comments. According to these latter, we have started a project on the characterization of MnO<sub>2</sub> resin. We are also working on the adaptation of Eichrom procedures to larger sample sizes (>10 g) and more complex matrices such as soils, sediments, food. We'll let you know about the results in future issues of RadChem Info.

We remind you that in 2006 we would like to organize a workshop where attendees will present and share their Lab experience on Eichrom products. This workshop is foreseen for the last quarter of the year. We are thus inviting you to send the subjects you would like to present either by fax or by e-mail.

## Technical Info

### Resolve™ Filters

It is important prior using the Resolve™ filters to rinse the filter with 3-5 mL 80% ethanol. The filter is hydrophobic and the ethanol rinse is necessary to achieve good flow characteristics.



## Auto-deposition disks / Po-210 alpha source preparation



Pb-210 and Po-210 are two radionuclides for which measurement is proposed in our Water Lab. Pb-210 is measured by liquid scintillation counting and Po-210 by alpha spectrometry after auto-deposition on silver disks. We are currently comparing auto-deposition recoveries on both silver and nickel disks.

Both silver and nickel disks (25,4mm diameter) with protective tape on one side should be available from Eichrom during this year.

Figure 4 : Po-210 Auto-deposition unit.

Do not hesitate to contact us for more details

# Agenda

## 2006 Conferences

These are the Conferences/Congresses we plan to attend this year.

- > MARC VII : 3 - 8 April 2006, Hawaii - USA ([www.min.uc.edu/nuclear/marc/vii.shtml](http://www.min.uc.edu/nuclear/marc/vii.shtml))
- > 15<sup>th</sup> Radiochemical Conference : 23 - 28 April 2006, Mariánské Lázně - Czech Republic (<http://www.fjfi.cvut.cz/radchem/>)
- > 2<sup>nd</sup> European Congress of the International Radiation Protection Association (IRPA) : 15 - 19 May 2006, Paris - France (<http://www.irpa2006europe.com/>)
- > 34<sup>th</sup> International Symposium of Environmental Analytical Chemistry : 4 - 8 June 2006, Hamburg - Germany ([http://www.iaec.ch/iseac\\_symposium/iseac\\_home.html](http://www.iaec.ch/iseac_symposium/iseac_home.html))
- > International Workshop on Frontiers and Interfaces of Ion Exchange : 11 - 15 June 2006, Antalya - Turkey (<http://www.dalyatur.com/iiew2006/>)
- > Procorad : 20 - 23 June 2006, Constanza - Romania ([http://www.procorad.org/fr/avenir\\_reunion/](http://www.procorad.org/fr/avenir_reunion/))
- > International Congress on Analytical Sciences : 25 - 30 June 2006, Moscow - Russia (<http://www.icas2006.ru/>)
- > Euroscience Open Forum 2006 : 15 - 19 July, Munich - Germany (<http://www.esof2006.org/programme.php4>)
- > 1<sup>st</sup> European Chemistry Congress : 27 - 31 August 2006, Budapest - Hungary (<http://www.euchems-budapest2006.hu/>)
- > Environmental Radiochemical Analysis, 10<sup>th</sup> International Symposium : 13 - 15 September 2006, Oxford - United Kingdom (<http://www.rsc.org/ConferencesAndEvents/MemberEvents/ERA/Accommodation.asp>)
- > 2<sup>nd</sup> Topical Workshop in Low Radioactivity Techniques (LRT 2006) : 30 September - 3 October 2006, Aussois - France (<http://lrt2006.in2p3.fr/index.html>)
- > 52<sup>nd</sup> Radiobioassay and Radiochemical Measurement Conference : 23 - 27 October 2006, Chicago - USA (<http://www.rmc2006.org/>)