PRODUCT SHEET

PB resin

Main applications

- Separation of lead/polonium

Packing

Order N°.	Form	Particle size
PB-B25-A, PB-B50-A , PB-B100-A, PB-B200-A	25g, 50g, 100g, 200g bottles PB Resin	100-150 µm
PB-C20-A, PB-C50-A	20, 50 and 200 2 mL PB Resin columns	100-150 µm
PB-B25-S, PB-B50-S	25g and 50g bottles PB Resin	50-100 µm
PB-R50-S, PB-R200-S	50 and 200 2ml cartridges PB Resin	50-100 µm
PB-B10-F	10g bottle PB Resin	20-50 µm

Physical and chemical properties

Density : 0.37 g/ml
Capacity : 29 mg Pb/g resin PB

Conversion factor D_W/k' : 1,82

Conditions of utilization

Recommended T of utilization : /
Flow rate : A grade: 0.6 – 0.8 mL/min, utilization with vacuum or with pressure for s grade resin
Storage : Dry and dark, T<30°C

For additional information see enclosed literature study

Methods*

Reference	Description	Matrix	Analytes	Support
OTS01	Pb-210 in soil	Soil	Pb	columns
OTW01	Pb-210 and Po-210 in water	water	Pb, Po	columns, cartridges
Application note: 601	On-line Preconcentration and Determination Of Lead in Iron and Stelle by Flow Injection Flame Atomic Absorption Spectrometry	Iron, steel	Pb	columns, cartridges

*developped by Eichrom Technologies Inc.

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PB RESIN

Lead resin (PB resin) is composed of a crown-ether (fig 1) diluted in isodecanol and coated on an inert support. Its composition is similar to the Sr Resin with the exception of the diluent which is n-octanol in Sr Resin. Isodecanol, having a longer carbonated chain than n-octanol, is used to facilitate lead elution from the resin.

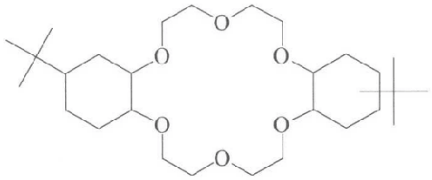

Fig. 1 : 4,4'(5')-di-t-butylcyclohexano-18-crown-6 (1).

The size of the cavity is 2,6 to 3,2Å (1). Experimental capacity of the Pb Resin is reported to be 29mg Sr/g resin.

The extraction equilibrium is assumed to be:

$$Pb^{2+} + 2NO_3^- + \overline{E} \Leftrightarrow \overline{Pb(NO_3)_2 E}$$

with E = crown ether.

Lead affinity (k'_{Pb}) for Pb Resin over the range 10E-02 to 10E+01 M HNO_3 is varying from ~20 to 800 (fig 2). In HCl media, k'_{Pb} for Pb Resin varies from 20 to 100. The maximum retention is observed between 5.10E-02 to 2 M HCl. Below and above these HCl concentrations, Pb affinity for the resin is rapidly decreasing.

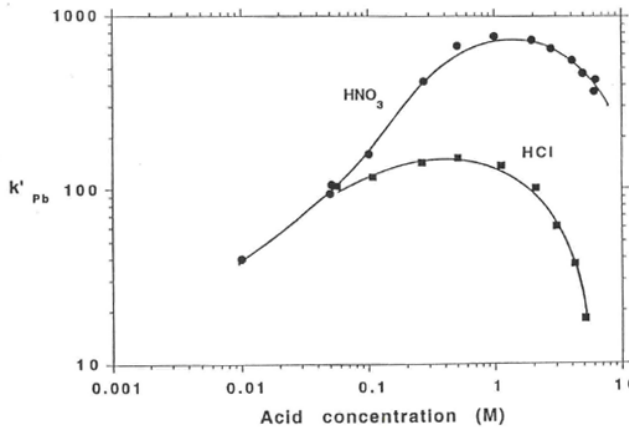

Fig. 2: Pb k' values on Pb Resin in HNO_3 and HCl media[1]

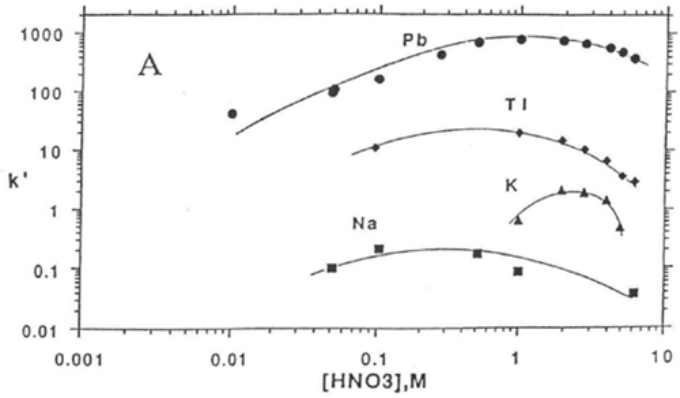

Fig. 1 : k' values of monovalent ions and Pb on the Pb Resin in HNO_3 (1).

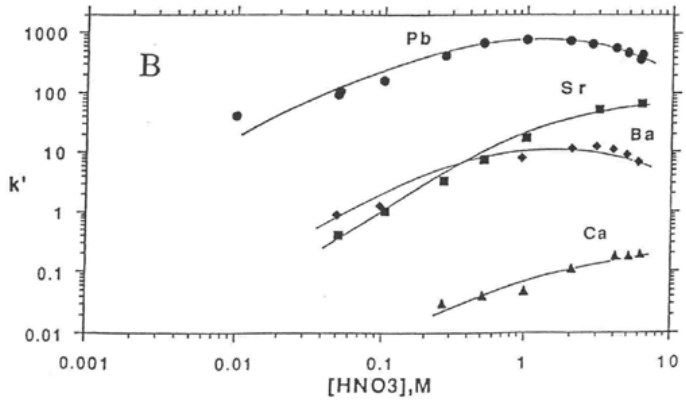

Fig. 2 : k' values of divalent ions and Pb on the Pb Resin in HNO_3 (1).

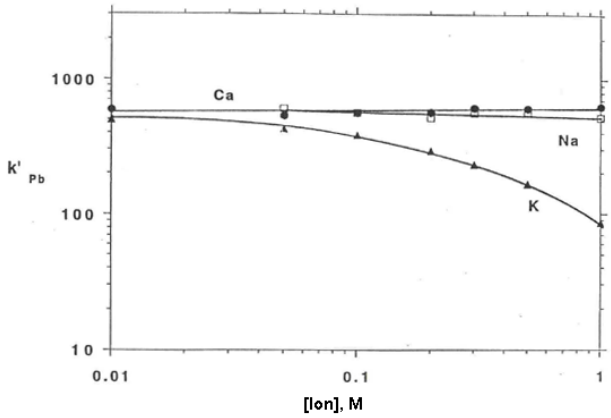

Fig. 3 : Influence of interfering ions on k'Pb on Pb Resin in HNO_3 (1).

Monovalent and divalent ions show similar retention behaviour as those observed on Sr Resin (fig 3 and 4). Sodium and calcium do not interfere with the lead uptake on the Pb resin for concentrations from 10E-02 to 1 M (fig 5). The presence of potassium up to 1M still allows a lead uptake with k'Pb~80. In 0.1M HNO_3, most ions are

not retained on the resin, only Pd is partly fixed. This latter is completely eluted with a rinse of 40 free column volumes.

Elution of lead can be performed with different solutions as 0.1M ammonium citrate, 0.1M ammonium oxalate or 0.1M glycine[1].

Pb Resin is used in different types of applications. The main one of these is the separation and measurement of Pb-210 in water samples. Due to the radio toxicity of both Pb-210 and its daughter Po-210, the World Health Organisation is recommending the determination of the activities of Pb-210 and Po-210 in drinking water samples in order to obtain more realistic values of the Total Indicative Dose (TID). Some countries (e.g. France) follow this recommendation already.

A method for Po-210/Pb-210 separation was presented in November 2006 at the Users' group meeting in Bratislava. Results are presented in figure 6. The sample is dissolved in 2M HCl and loaded onto a Pb resin column preconditioned with 2M HCl. Under these conditions Bi-210, other than Pb and Po, is not retained on the resin. Then Po-210 can be eluted with 0.1M HNO_3. Pb-210 can finally be eluted with a 0.1M citric acid solution [2].

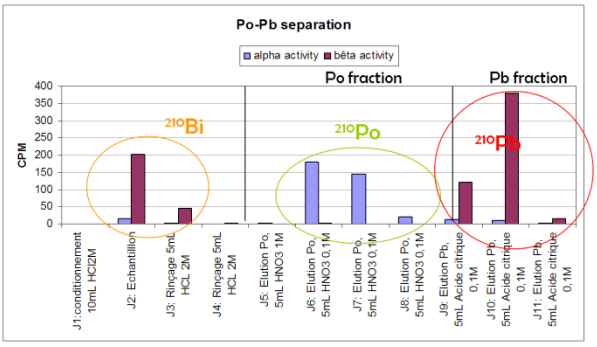

Fig. 6 : Separation scheme of Po-210/Pb-210 [3].

Pb Resin is also used for the measurement of lead in iron and steel by flow injection coupled to flame atomic absorption spectrometry [3]. Pb resin is preconditioned in 1M HNO_3 for 3 minutes with a 3mL/min flow rate. The sample (about 30 mL) of iron or steel in 1M HNO_3 media is introduced in a flow injection device. The resin is rinsed for 2 minutes with 1M HNO_3 at 3mL/min. Lead is finally eluted with a solution of 0.1M oxalate ammonium during 3 minutes with a flow rate of 4mL/min, in the opposite direction to the sample flow. The lead solution is directly introduced in the nebuliser of the spectrophotometer. The results obtained by the authors analysing certified reference materials agreed well with the corresponding reference values.

Bibliography

(1) Horwitz E.P., Dietz M.L., Rhoads S., Felinto C., Gale N.H., Houghton J.; Analytica Chimica Acta, Vol.292, p263-273 (1994) ; Eichrom reference HP194.

(2) Happel S., Le Berre M., Johanson L., Bombard A. ; Validation of an improved method for the separation and measurement of Pb-210 and Po-210; Users' Group Meeting, Bratislava - Slovakia, 10th November 2006.

(3) Seki T., Takigawa H., Hirano Y, Ishibashi Y. ; Analytical Sciences, Vol.16, p513-516 (2000) ; Eichrom reference ST001.