Ion Exchange Chromatography (IX) vs. Extraction Chromatography (EXC)

Eichrom User's Group Workshop RRMC 2014 Schultz Group – University of Iowa

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Eichrom's definition

Extraction chromatography (EXC) is a technique that is ideally suited to the separation of radionuclides from a wide range of sample types. This technique combines the selectivity of liquid-liquid extraction with the ease of operation of column chromatography. Table 1 lists a number of EXC resins that are manufactured by Eichrom.

Table 1. Chromatographic Resins from Eichrom Technologies

Material	Selectivity
TRU Resin	Actinides(III, IV, VI), Ln(III)
UTEVA Resin	U(VI)
TEVA Resin	Th(IV), Np(IV), Pu(IV), Tc(VII))
Sr Resin/Pb Resin	Sr, Pb
Ln Resin	Ln(III)
Actinide Resin	Actinides

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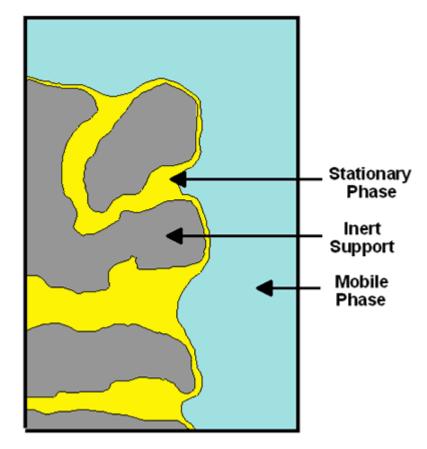
Table 1. Chromatographic Resins from Eichrom Technologies

Material	Selectivity
TRU Resin	Actinides(III, IV, VI), Ln(III), Po
UTEVA Resin	U(VI)
TEVA Resin	Th(IV), Np(IV), Pu(IV), Tc(VII))
Sr Resin/Pb Resin	Sr, Pb, Po, Ga, Pa
Ln Resin	Ln(III)
Actinide Resin	Actinides
1-octanol	Po, Ga, Pa

EXC system: Porous Beads

...three major components of an EXC system: the inert support, the stationary phase, and the mobile phase. ... Liquid extractants, either single compounds or mixtures, are used as the stationary phase.

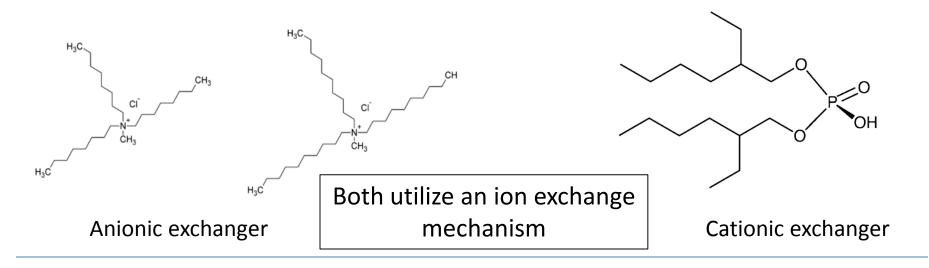
Surface of Porous Bead



Gray area?

TEVA – aliquat 336TM

LN resin - HDEHP



TRU resin - CMPO

C₈H₁₇ CH₂ CH₂ IBu

ABEC-like resin

$$\begin{array}{c|c}
 & C & C \\
 & H_2 & H_2 & n = 50
\end{array}$$

"Chelating"/Complex formation extractant

Absorbent

Discussion

- What distinguishes EXC from IX?
 Development method? Extraction method?
- Polymer covalently bonded (IX) vs. physisorption on "porous bead" (EXC)?
- Is Ion-Exchange a type of Extraction Chromatography?
- Can Extraction Chromatography be Ion-Exchange?
- Is anyone else confused?

Discussion

- What are the advantages/disadvantages or distinguishing factors of EXC vs. IX?
 - Loading capacity?
 - Separation factors?
 - Distribution coefficients?
 - Radiolysis?
 - Stripping of organics?
 - Kinetics?