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

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

Eric Eitrheim

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

http://www.eichrom.com/products/extraction.aspx

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.

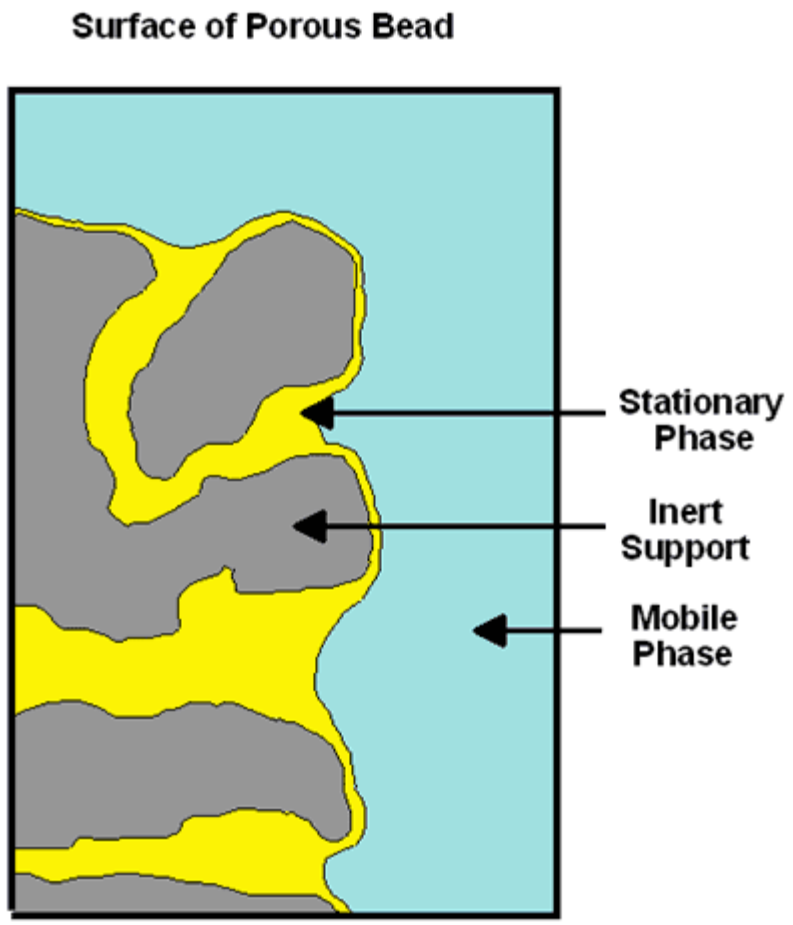
Table 1. Chromatographic Resins from Eichrom Technologies

Material	**Selectivity**
TRU Resin	Actinides(III, IV, VI), Ln(III), **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**

http://www.eichrom.com/products/extraction.aspx

EXC system: Porous Beads

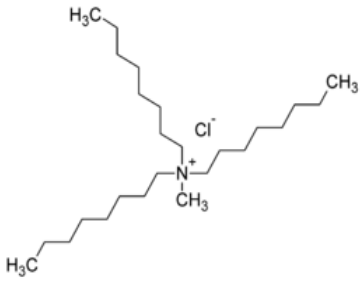
…three major components of an EXC system: the inert support, the stationary phase, and the mobile phase. … **Liquid extractants**, either single compounds or mixtures, are used as the stationary phase.

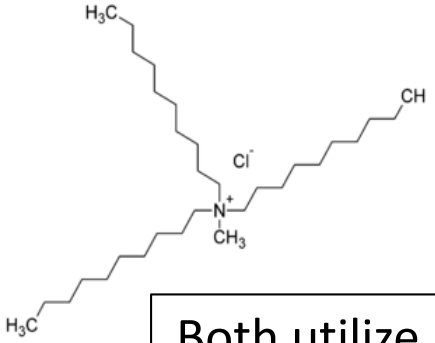


http://www.eichrom.com/products/extraction.aspx

Gray area?

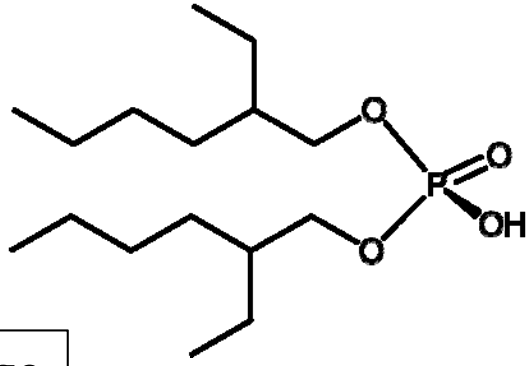
TEVA – aliquat 336™





Anionic exchanger

LN resin - HDEHP



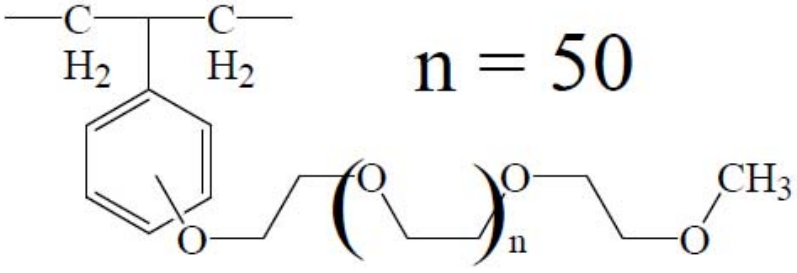
Cationic exchanger

Both utilize an ion exchange mechanism

TRU resin - CMPO

"Chelating"/Complex formation extractant

ABEC-like resin



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?