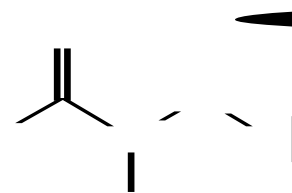


Zirconium Separation on ZR Resin

Summary of Method ZR resin contains a hydroxamate extractant which exhibits a high selectivity for Zr(IV), Ti(IV) and Nb(V) over Y(III), Sc(III) and Fe(III). From 0.01-10M HCl, Zr, Ti and Nb are strongly retained by the ZR resin, while Y and Sc are poorly retained. Fe(III) is strongly retained from 0.01-1M HCl and can be eluted from the ZR resin with 2-3M HCl. Zr can be recovered from the ZR resin with 0.1M oxalic acid, while Ti and Nb elution requires >0.25M oxalic acid.

The unique selectivity of ZR resin makes it a useful material for the separation of emerging PET nuclides from their target materials, such as Zr(IV) from Y(III) and Ti(IV) from Sc(III). The target materials can be dissolved in high concentrations of hydrochloric acid and the dissolved target loaded onto ZR resin. Zr(IV) or Ti(IV) is retained, while the bulk target mass, Y(III) or Sc(III) passes through the ZR resin. Rinsing the ZR with 2-10M HCl completes removal of the target material and any Fe(III) present in the sample. The ZR resin can then be rinsed with more dilute HCl to reduce the residual acidity, Zr(IV) can be stripped using 0.1M oxalic acid, and Ti(IV) can be stripped with 0.25M oxalic acid. Further purification of the Zr(IV) or Ti(IV) can be achieved by loading the Zr(IV) or Ti(IV) onto strong base anion exchange resin from dilute oxalic acid-HCl.

The easily hydrolyzed Zr(IV), Ti(IV) and Nb(V) should be stored in solution containing trace HF or oxalic acid to prevent loss of material to vials or formation of colloidal aggregates.



Hydroxamate Extractant

Reagents

ZR Resin 2 mL Cartridges (Eichrom ZR-R10-S)
1 mL Cartridges (Eichrom ZR1-R10-S)
0.3 mL Cartridges (Eichrom ZR0.3-R10-S)
Bulk Resin (Eichrom ZR-B25-S)
Hydrochloric Acid (37%)
Oxalic Acid
Deionized Water
Hydrofluoric Acid (49%) - Optional

Equipment

Vacuum Box (Eichrom AR-24-BOX or AR-12-BOX)
Cartridge Reservoir, 20 mL (Eichrom AR-200-RV20)
Inner Support Tubes-PE (Eichrom AR-1000-TUBE-PE)
Yellow Outer Tips (Eichrom AR-1000-OT)
50 mL Centrifuge Tubes
Vacuum Pump

Zirconium Separation on ZR Resin and Anion Exchange

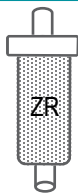
(1) Precondition 2 mL ZR Resin cartridge with 10 mL 6M HCl.

(2) Load 10-100 mL sample in 6M HCl. Zr is retained. Y(III) elutes.

(3) Rinse column with 25 mL 2M HCl. Add 0.1M ascorbic acid to improve Fe decontamination.

(4) Rinse column with 10 mL 2M HCl.

(5) Strip Zr with 15 mL 0.05M oxalic acid.



(6) Precondition 1 mL 1x8 cartridge with 10 mL 0.05M oxalic acid-0.05M HCl.

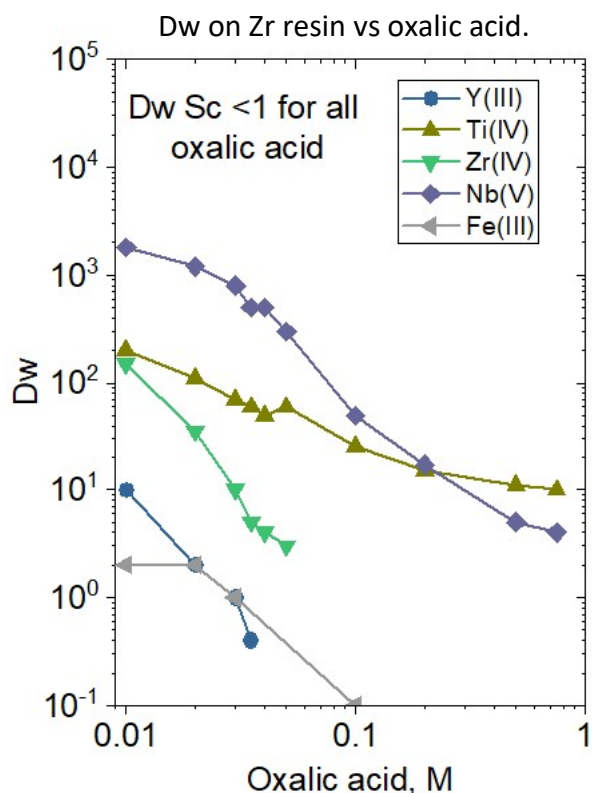
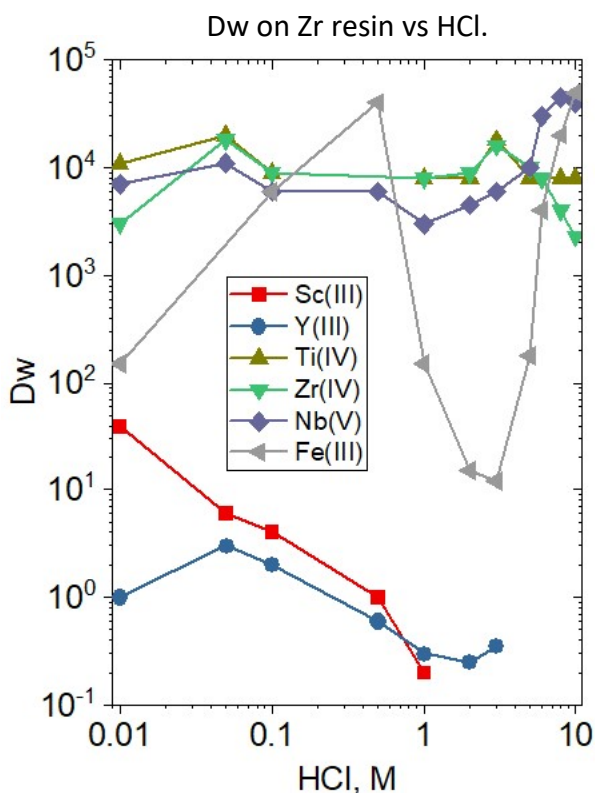
(7) Add 5 mL 0.1M HCl to sample from step (5). Mix.

(8) Load onto 1 mL 1x8 cartridge.

(9) Rinse cartridge with 20 mL 0.05M oxalic acid-0.05M HCl.

(10) Rinse cartridge with 5 mL 37% HCl.

(11) Strip ^{89}Zr with 5 mL 2-4M HCl.



References

- 1) Dirks, et al., "On the Development and Characterization of a hydroxamate based extraction chromatographic resin," 61st Radiobioassy and Radiochemical Measurements Conference, October 25-30, 2015, Iowa City, Iowa.
- 2) Triskem INFOS, No 15, February 2016. http://www.triskem-international.com/scripts/files/59d1f4fc31f796.50370140/tki_15_en_web.pdf