Separation of ^{89}Zr From Y Target

AN-1622-10

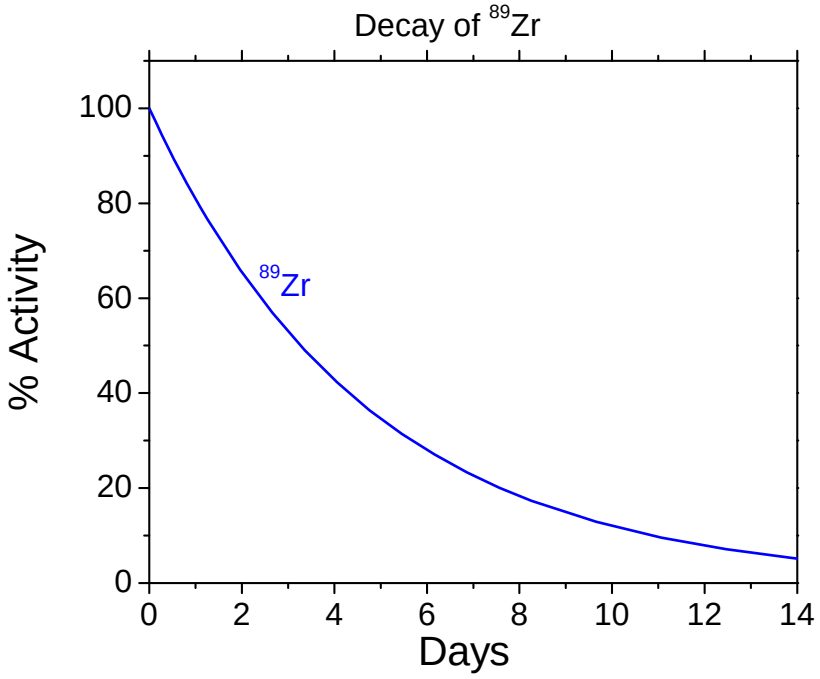
Summary of Method A method for the separation of ^{89}Zr ($t_{1/2}$ = 78.43 hours) from yttrium target material is presented. The method employs 2mL cartridges of LN3 and Anion Exchange resins to obtain high purity ^{89}Zr in small volumes of eluate, while providing high separation factors from chemical and radiologic impurities. The primary separation of ^{89}Zr from the dissolved yttrium target can be performed in 2-8M HNO_3 or HCl using LN3 resin. ^{89}Zr is retained while yttrium passes through LN3. ^{89}Zr is recovered from LN3 with a small volume of 0.05M HCl-oxalic acid and directly loaded onto a 2mL cartridge of Anion Exchange resin. ^{89}Zr is retained while additional decontamination from yttrium and niobium is achieved. ^{89}Zr is then recovered in a small volume of 2-4M HCl. Average yield of Zr, separated from 500mg Y, was >90%, with >10^6 separation factor from Y and Nb.

Reagents

LN3 Cartridges (Eichrom L3-R50-S)
Anion Exchange Cartridges (Eichrom A8-R50-M-Cl)
Deionized Water
Oxalic Acid
Ammonium Oxalate
HCl
HNO_3

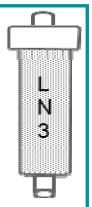
Equipment

Glass or plastic vials/bottles for collection of ^{89}Zr and waste.
30mL and 60mL plastic luer lock syringes.
Gamma Spectrometry System or alternative for measurement of ^{89}Zr.
ICP-AES or alternative for measurement of Y.



^{89}Zr Separation

(1) Dissolve yttrium target. Adjust to 50-100mL of 2-8M HCl or HNO_3.



(2) Precondition 2mL LN3 cartridge with 10mL 2-8M HCl or HNO_3.

(3) Load sample onto LN3 resin at 2-3mL/min.

(4) Rinse LN3 with 10mL 2M HCl.

(5) Replace syringe or reservoir with clean syringe or reservoir.

(6) Rinse LN3 with 40mL 2M HCl.

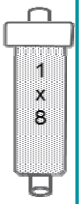
(7) Precondition 2mL anion exchange cartridge with 10mL 0.05M HCl-0.05 oxalic acid.

(8) Place anion exchange cartridge below LN3 cartridge.

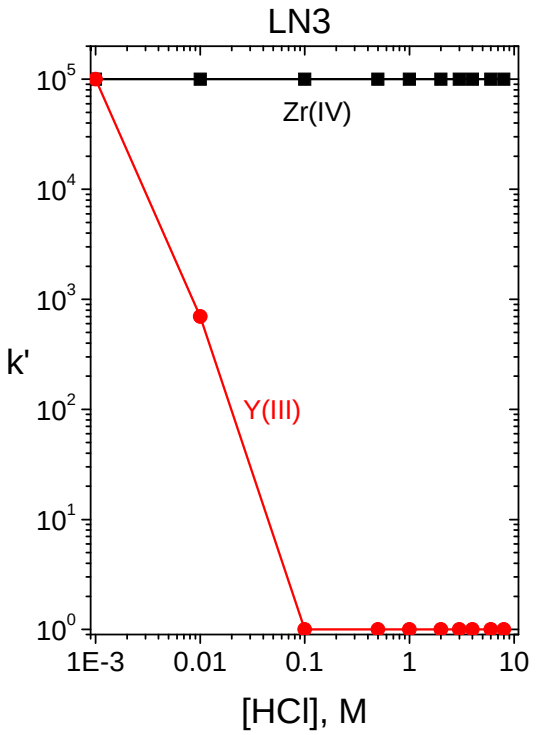
(9) Strip ^{89}Zr from LN3 and load onto anion exchange with 25mL 0.05M HCl-0.05M oxalic acid.

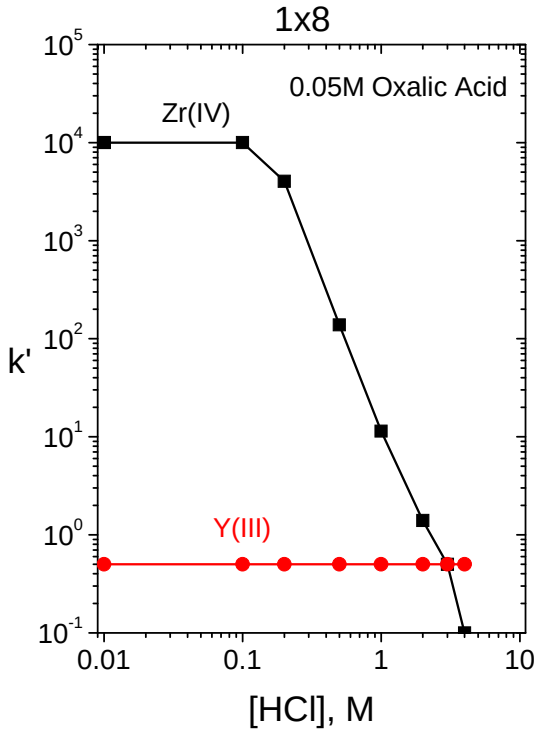
(10) Separate LN3 and anion exchange cartridges.

(11) Rinse anion exchange cartridge with 10mL 37% HCl.



(12) Strip ^{89}Zr with 10mL 2-4M HCl.





References

1) E. P. Horwitz and D. R. McAlister, Unpublished data (2015 and 2016)