A Method for the Separation of Gallium and Actinides in Plutonium Nuclear Materials using Extraction Chromatography:

Technical Challenges with Divalent Cation Mitigation

Eric Eitrheim

University of Iowa – Department of Chemistry

Eichrom User's Group Workshop

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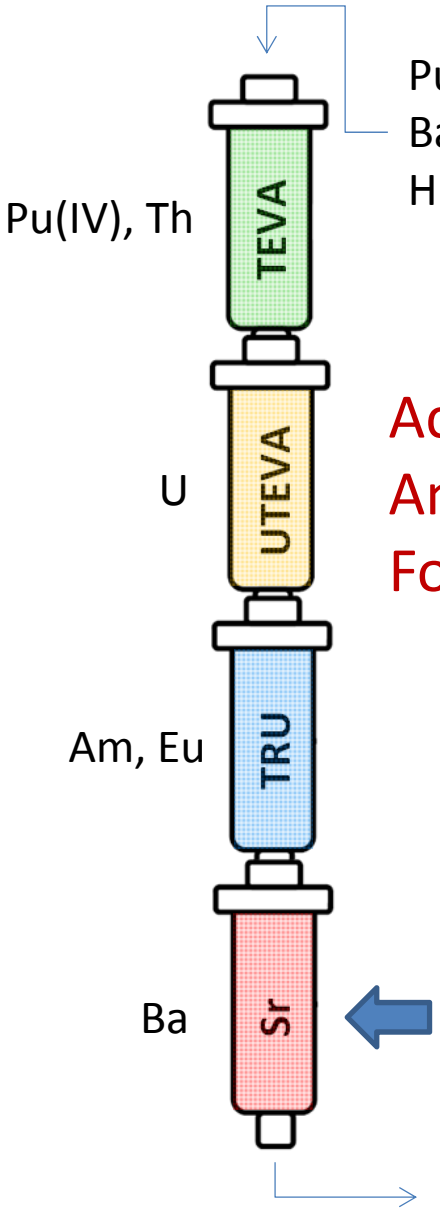
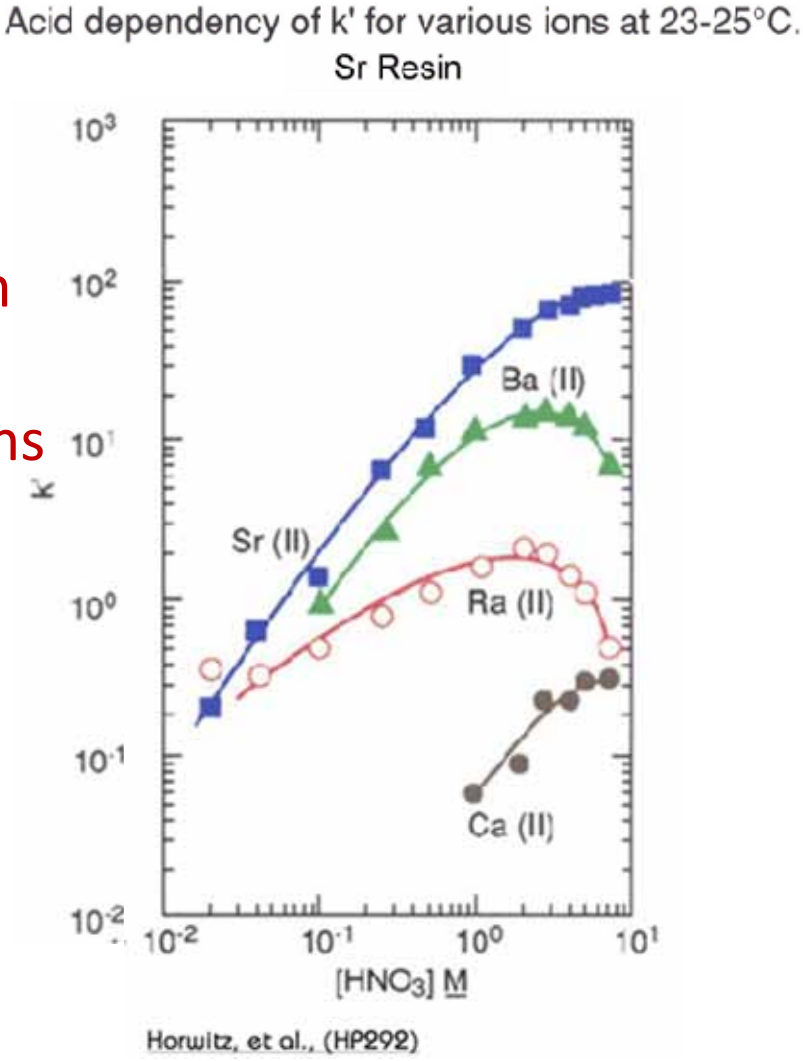
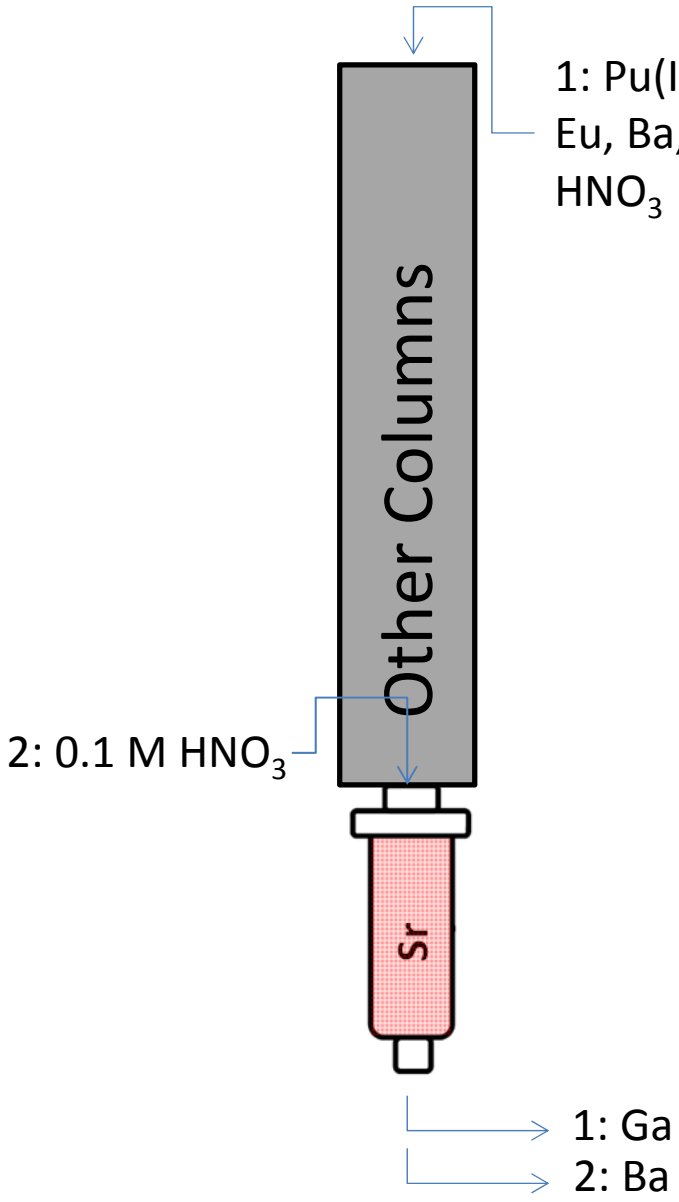
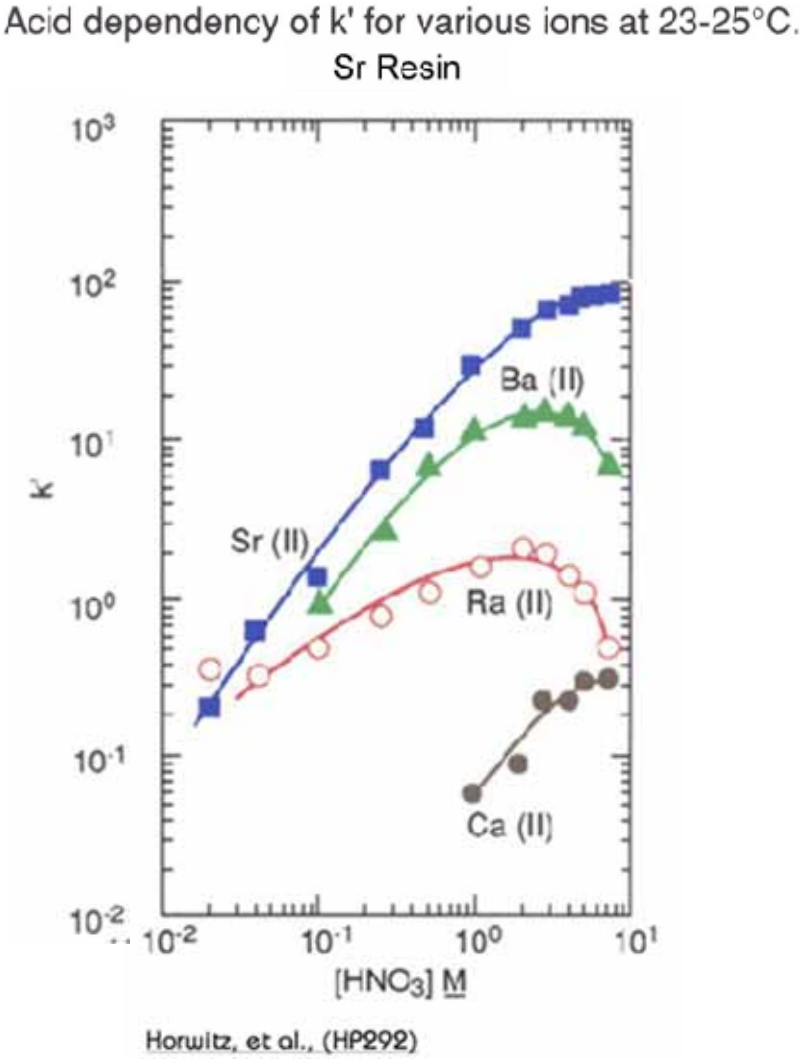


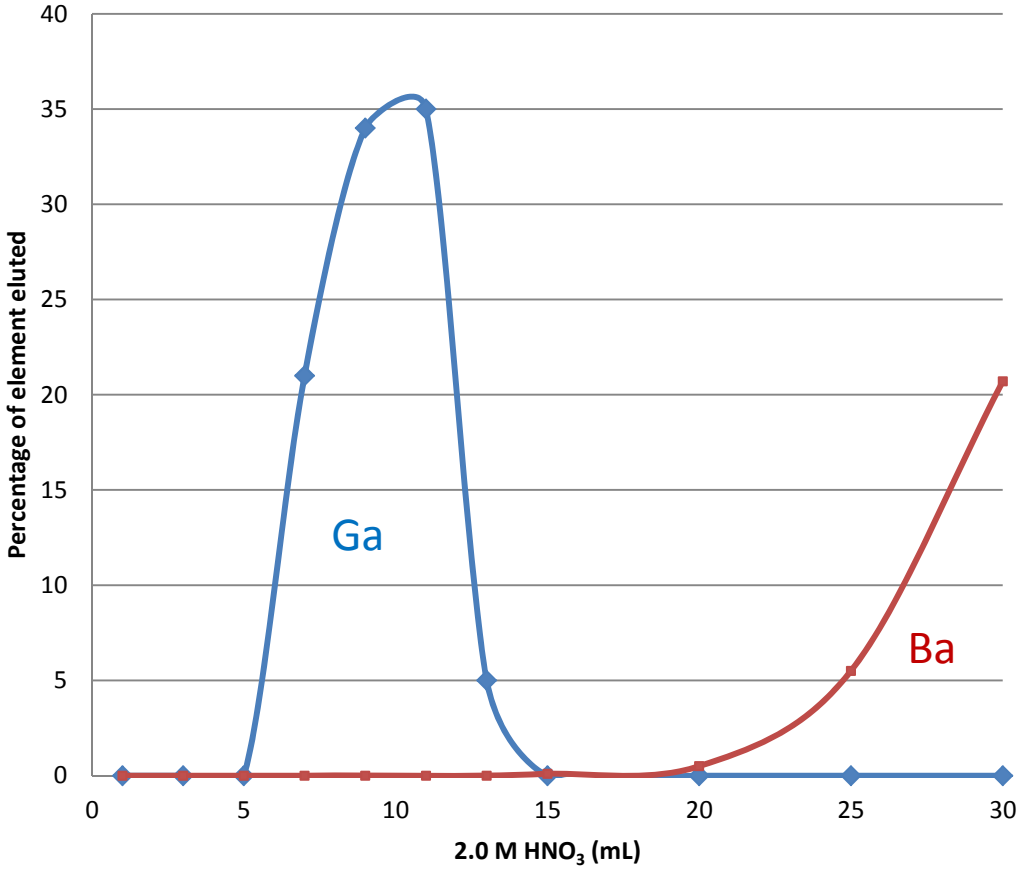
Actinide and Gallium Analysis for Nuclear Forensics Applications



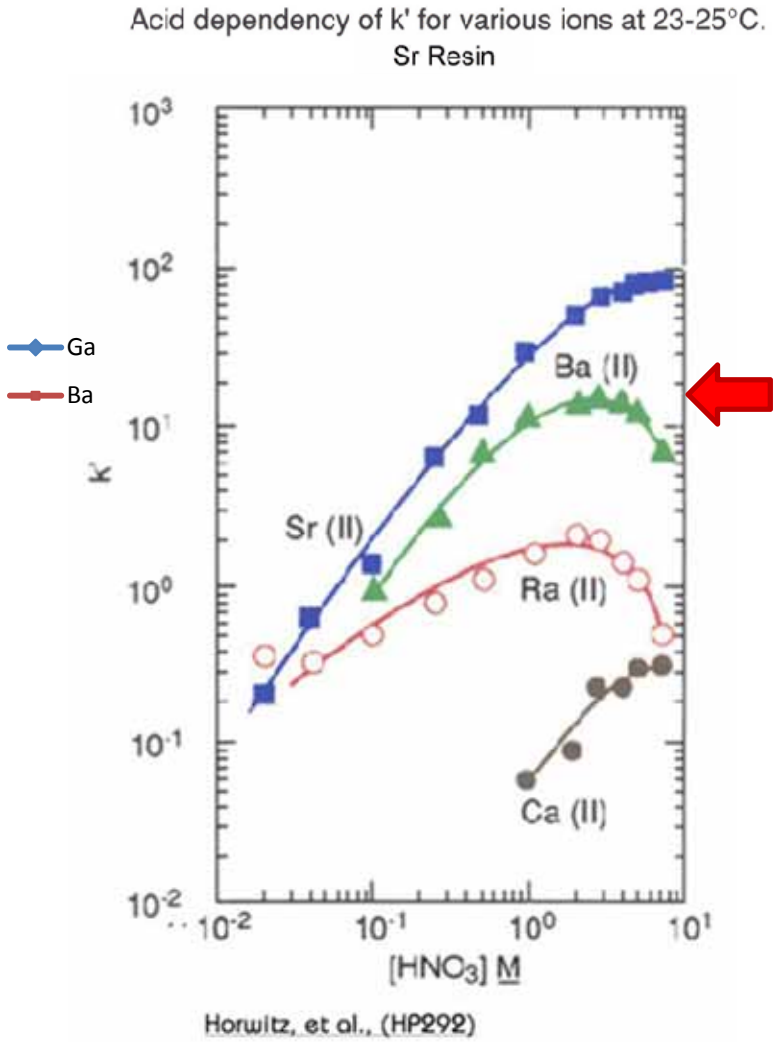

1: Pu(IV), Th, U, Am, Eu, Ba, and Ga in 2.0 M HNO_3
Other Columns
2: 0.1 M HNO_3
Sr
1: Ga
2: Ba


Acid dependency of k' for various ions at 23-25°C.
Sr Resin
k'
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
Ba (II)
Sr (II)
Ra (II)
Ca (II)
10^{-2}
10^{-1}
10^0
10^1
[HNO_3] M
Horwitz, et al., (HP292)

Gallium and Barium elution on TEVA, UTEVA, TRU, and Sr tandem resins



*15 mL 2.0 M HNO_3



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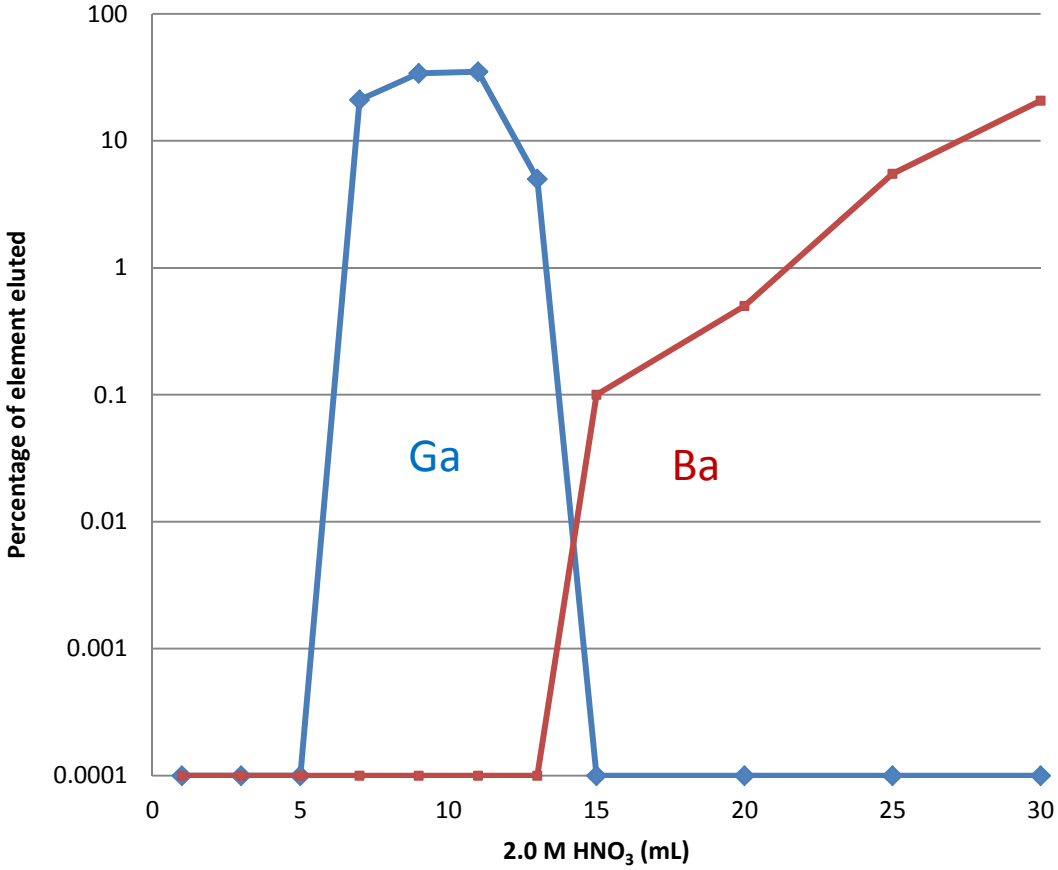
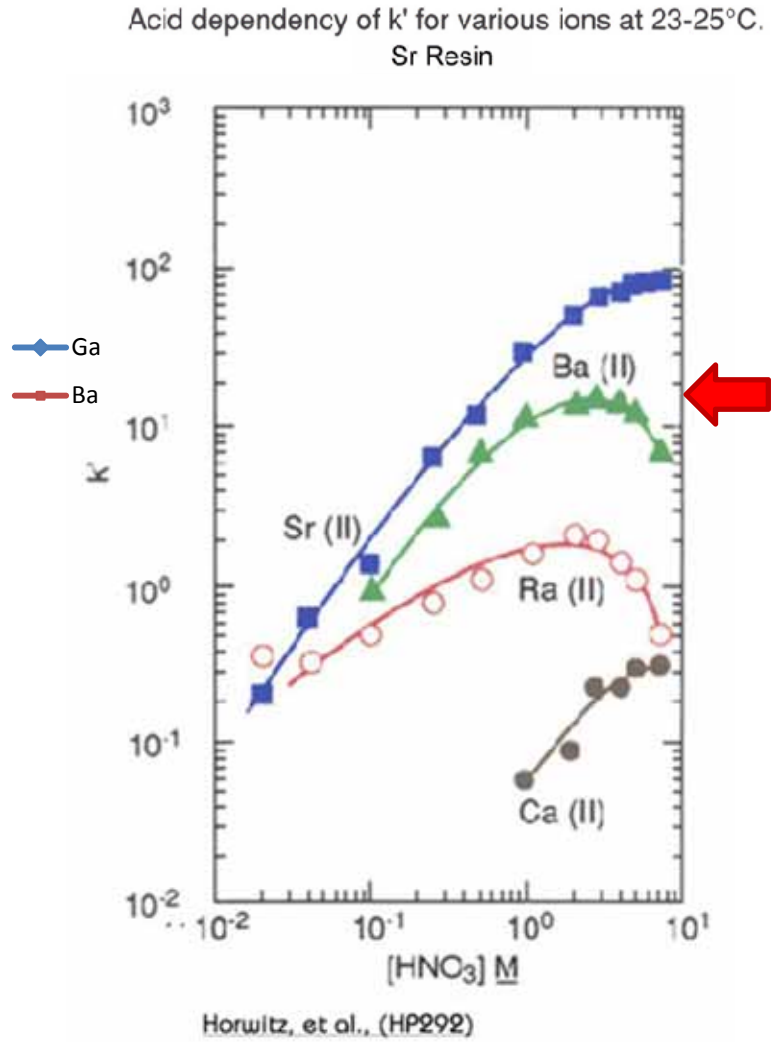


*15 mL 2.0 M HNO_3

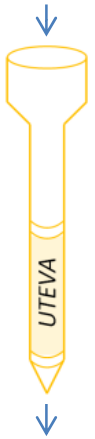


What are some options for ***divalent cation mitigation?***

- Preconcentration step (MnO_2, $Fe(OH)_3$, Sulfate precipitation, other)?
- Alternative Chromatographic resins?

Separation of divalent cations from Gallium using HCl on UTEVA

I. Take to dryness
II. E1: Take up in 4 M HCl (5mL), Load
E2:Rinse 4-9 M HCl (10 mL)
E3: Elute 1 M HCl (10 mL)



E1-E2: discard
E3: Ga