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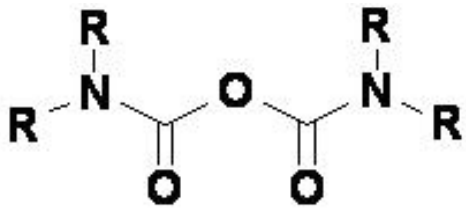
DGA Resin
Properties and Application

UGM05 - 09/12/05 - Manchester

Outline

- Presentation of DGA
- Am separation
- Ra/Ac separation
- Sr/Y separation
- Conclusion

DGA Resins



R = C_8

$$M^{3+} + 3NO_3^- + 3\overline{E_3} \Leftrightarrow \overline{M(NO_3)_3 \bullet E_3}$$

- DGA, Normal (*N,N,N',N'*-tetra-n-octyldiglycolamide)
- DGA, Branched (*N,N,N',N'*-tetrakis-2-ethylhexyldiglycolamide)

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Physical constants for Slurry-Packed columns of DGA Resin

Data	DGA, Normal	DGA, Branched
Extractant density (g/mL)	0,88	0,89
Bed density (g/mL)	0,38	0,38
Resin density	1,13	1,13
Volume of extractant (v_s)	0,17	0,17
Volume of mobile phase (v_m)	0,66	0,66

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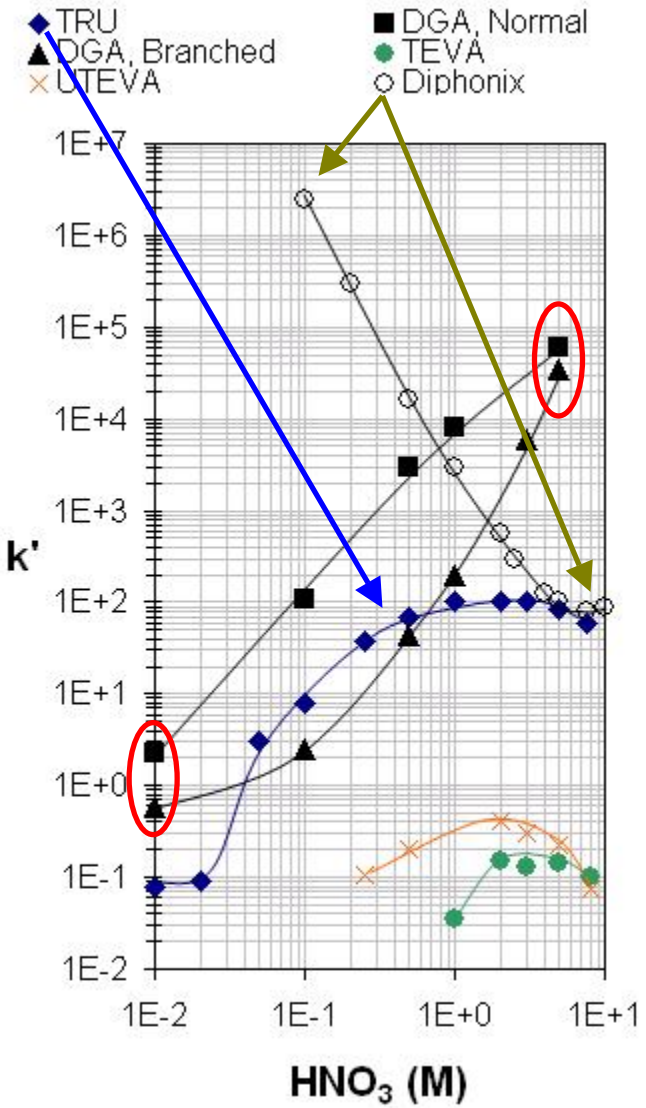
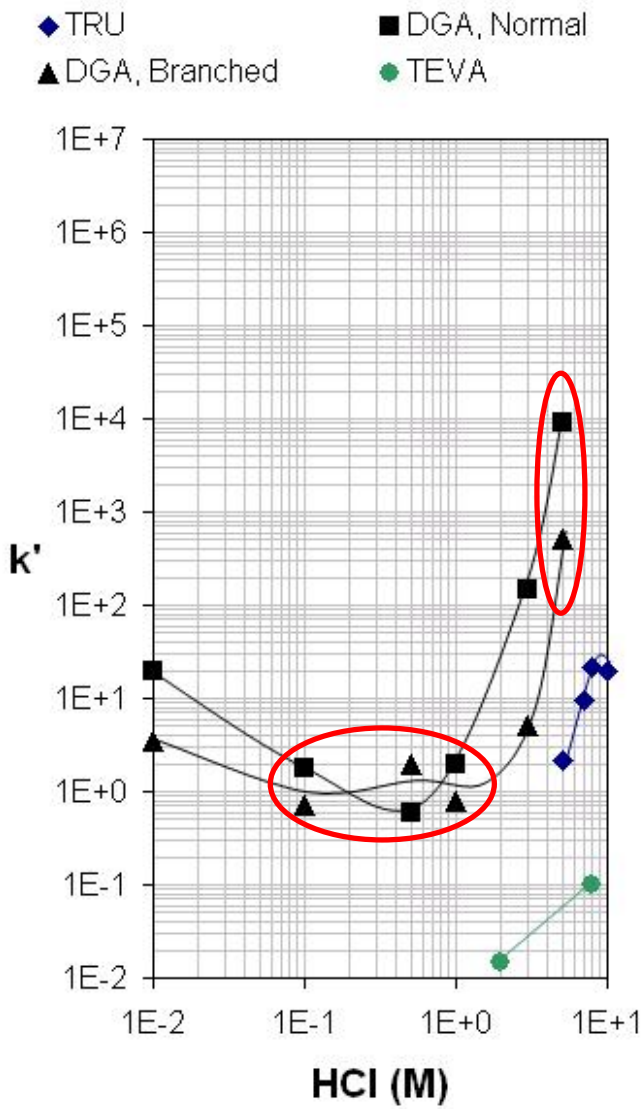
Americium elution profiles





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Americium Elution profiles

- Selective retention of Am on DGA compared to other Eichrom resins:
  - Am fixed at high concentrations of HNO3 or HCl ($k'_{HNO3} \cong 2\text{-}5.10^4$ and $k'_{HCl} \cong 500\text{-}10^4$)
  - Am stripped by either 0.01 M HNO3 or 0.1-1M HCl ($k' \cong 1$)

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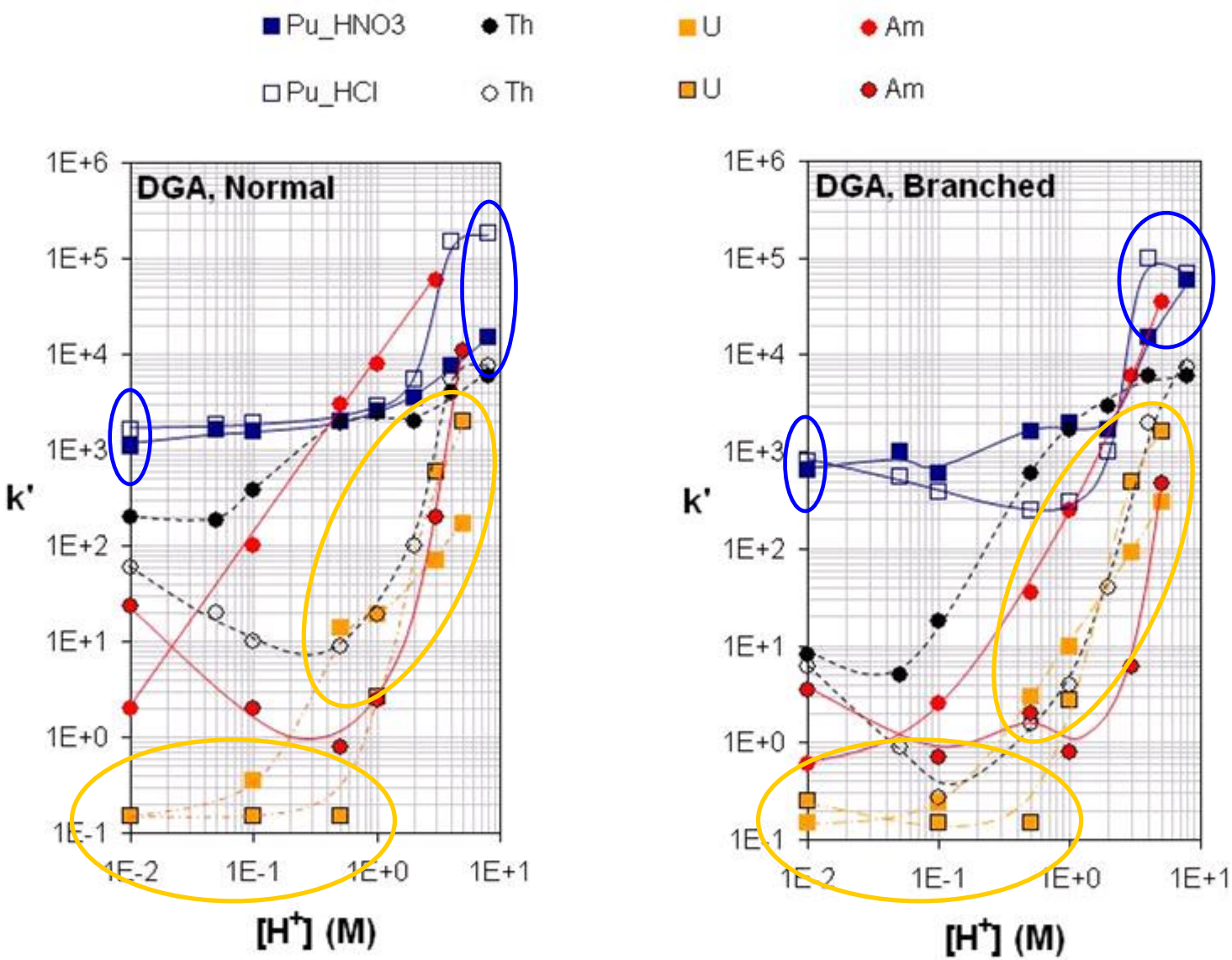
Americium Separation



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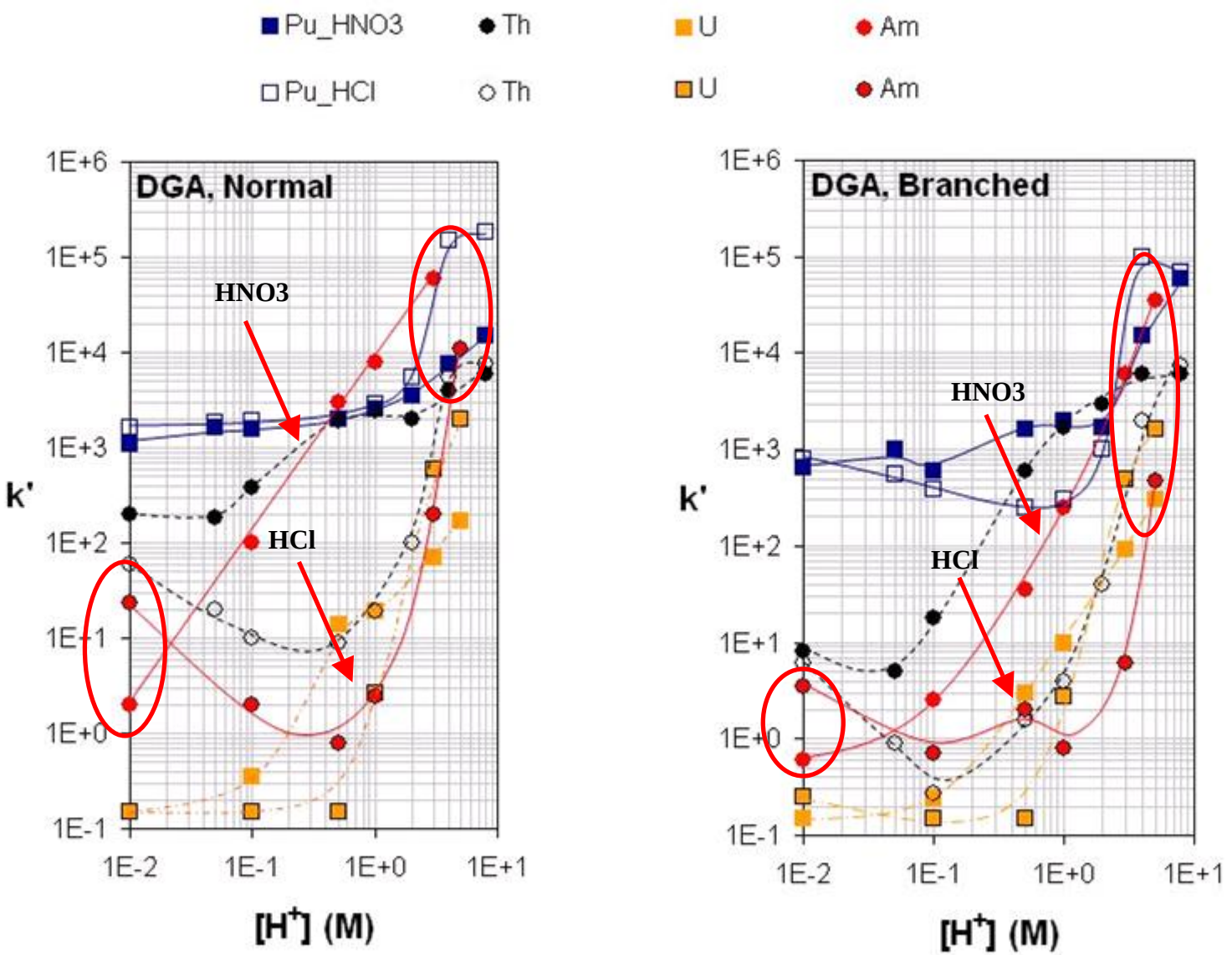
Americium Separation



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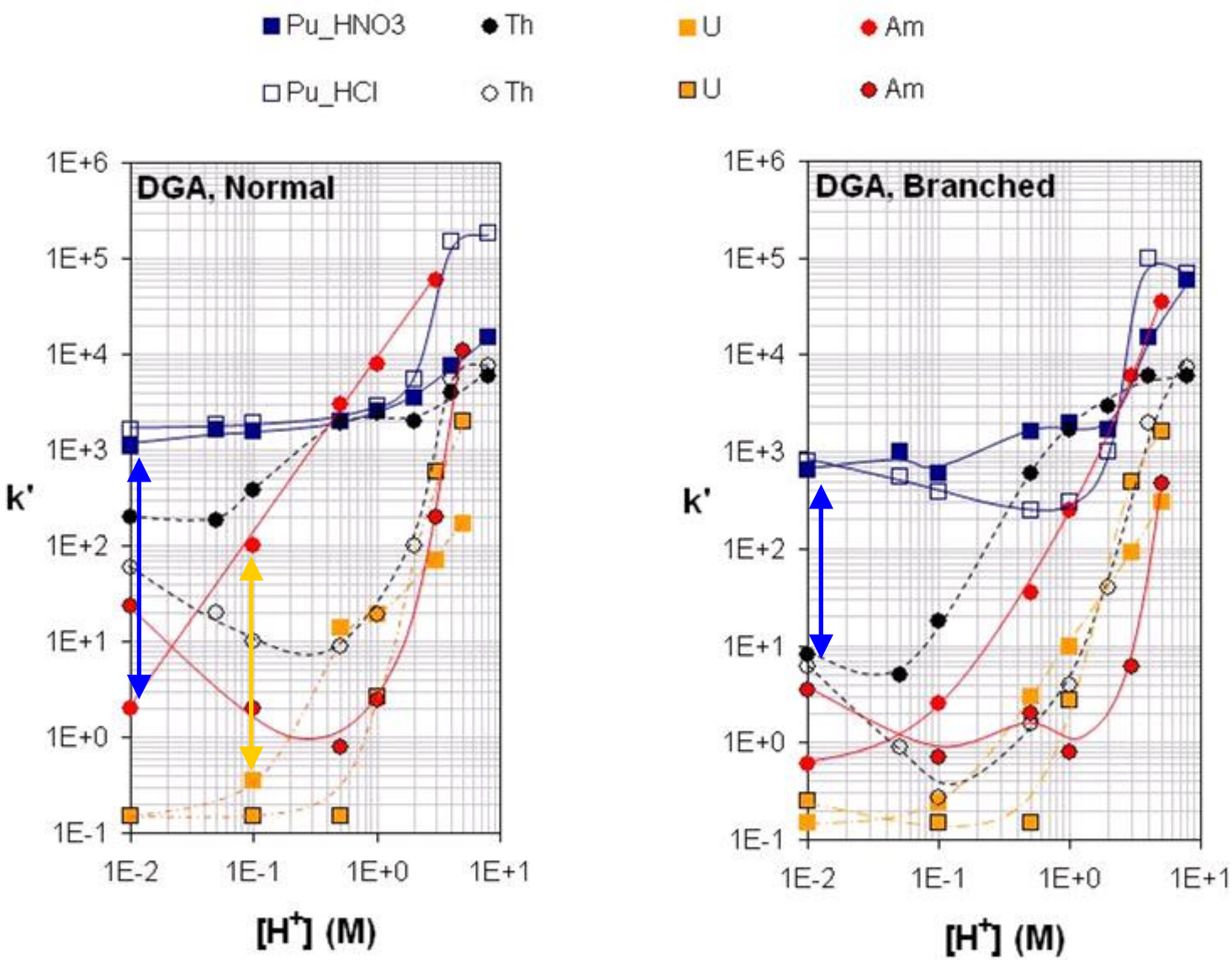
Americium Separation



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Americium Separation

- Selective separation from Pu with either 0.01 M HNO3 or HCl on both DGA resins
  - $k'_{Pu} \cong 10^3$-10^5
- Selective separation Am/U on DGA,Normal:
  - Stripping U with 0.1 M HNO3
  - Stripping Am with 0.5 M HCl
- $k'_{DGA,Branched}$ smaller than $k'_{DGA,Normal}$

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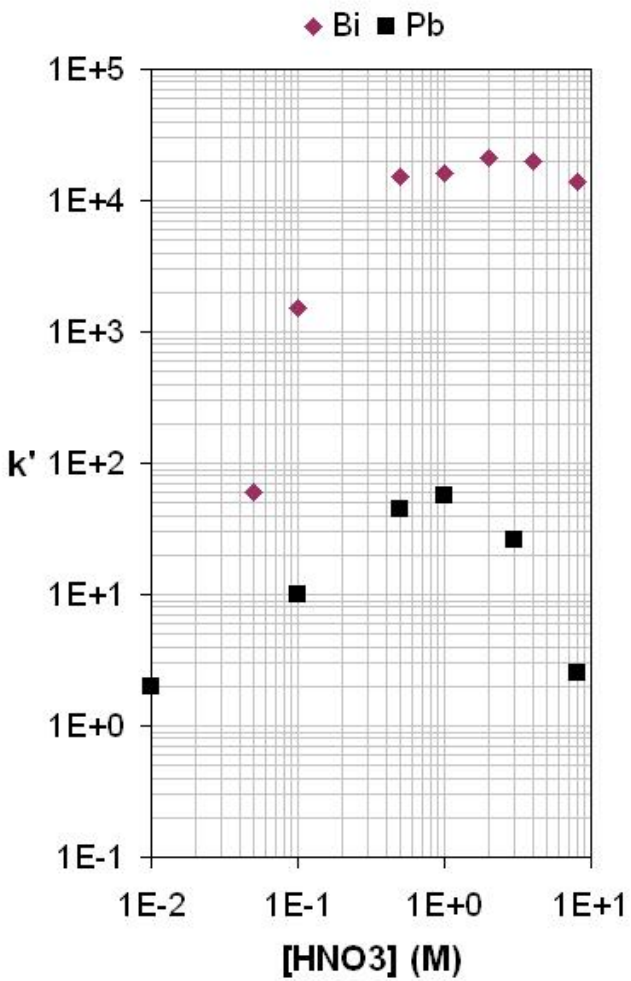
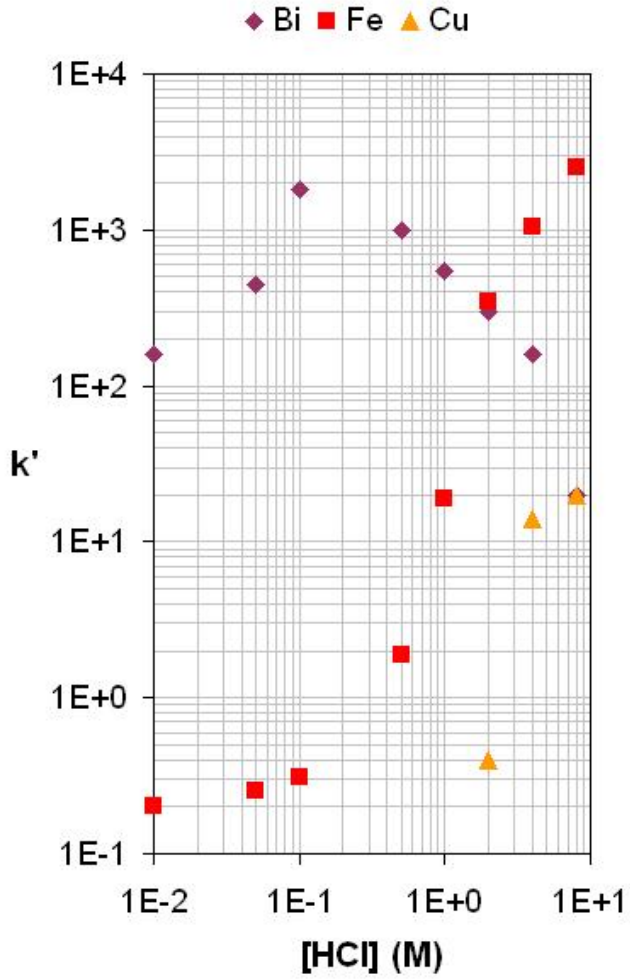
Interferants



k' for **V(V), Ti(IV), Al(III), Fe(III)**, Co(II), Cu(II), Ni(II), Zn(II) **< 2 for all [HNO_3]**



k' for **Ti(IV), Al(III)**, Co(II), Ni(II), Pb(II), Zn(II) **< 2 for all [HCl]**

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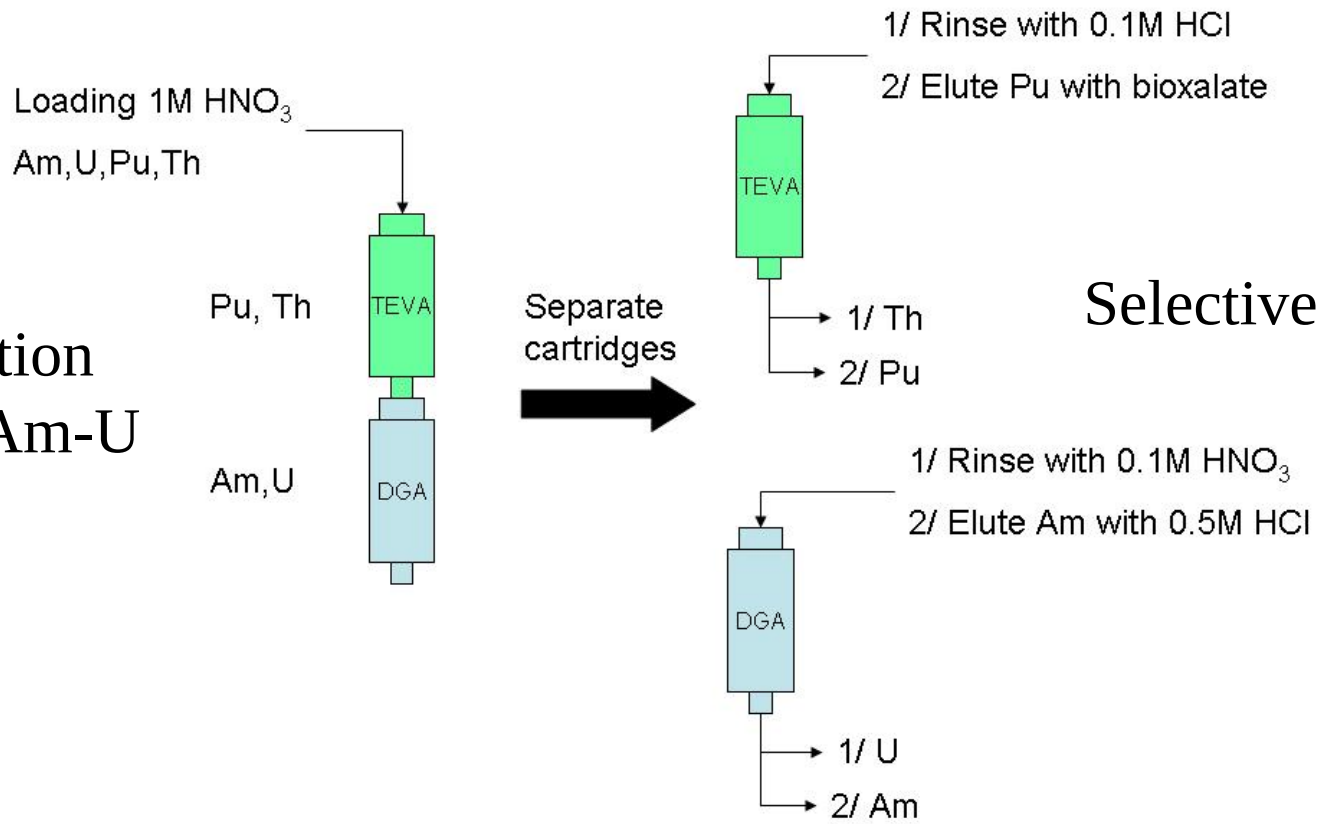
Multi-element Separation

Separation Ac(IV)/Am-U



Selective elutions

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Radium/Actinium separation

- Measurement of ^{226}Ra and ^{228}Ra
  - Chemical yield: ^{133}Ba (γ-spec.)
  - Measure of ^{226}Ra: Micro-precipitation
  - Measure of ^{228}Ra via ^{228}Ac (γ-spec.)
- Actinium: same chemistry as La and Ce

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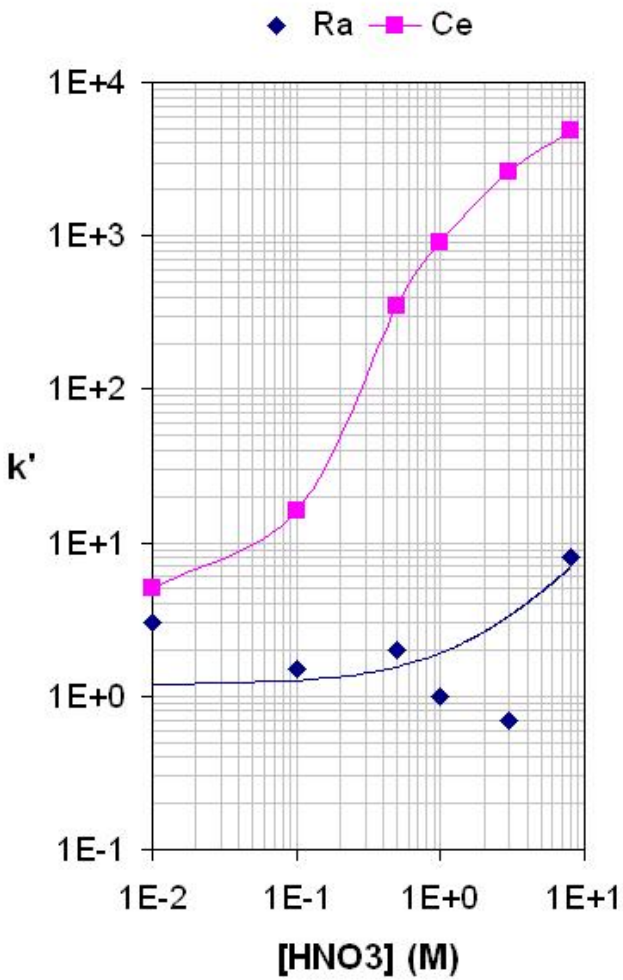
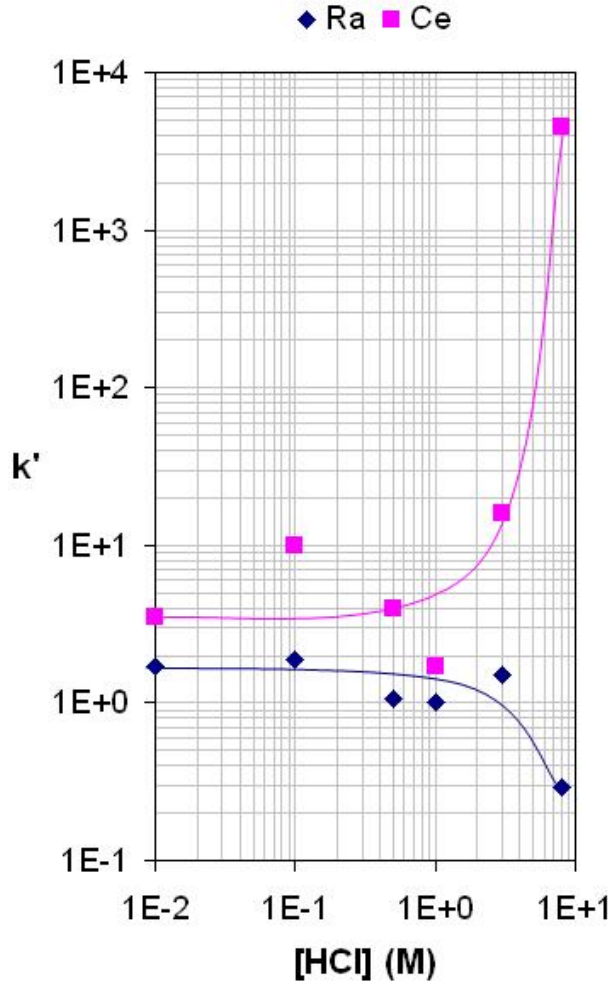
Radium/Actinium separation





- Results obtained on DGA,Normal (50-100µm)

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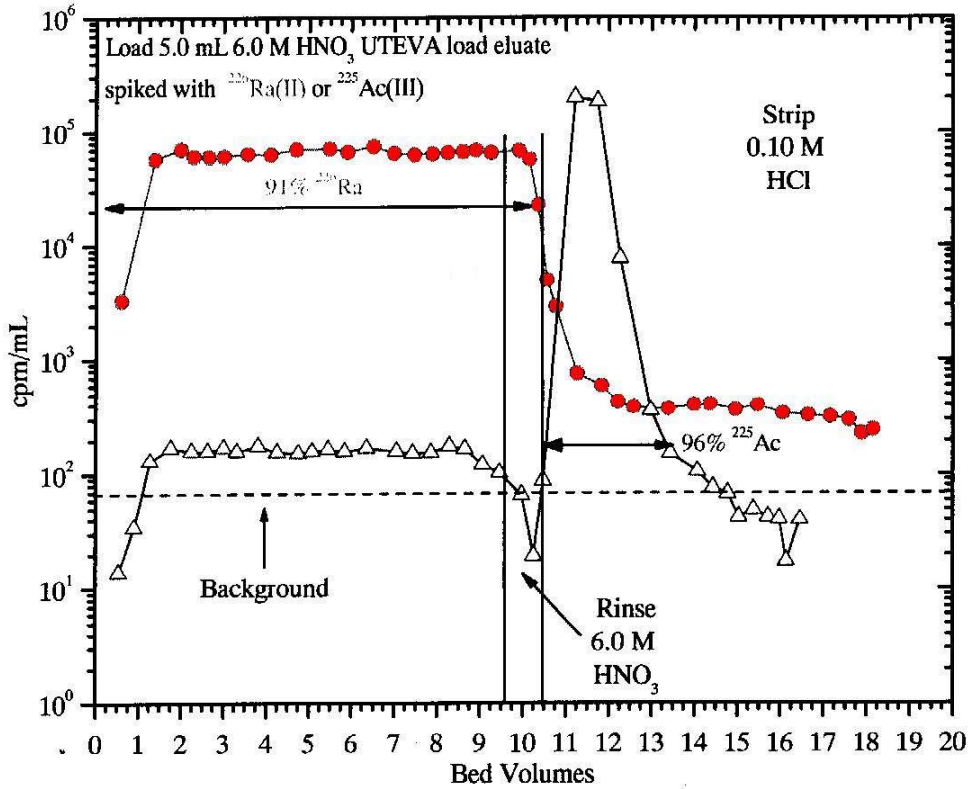
Radium/Actinium separation



Separation of Ac(III) and Ra(II) on TODGA resin (50-100 µm) with 6.0 M HNO_3 and 0.1 M HCl, 0.5 mL bed volume, flow rate equals 2 mL/min load/rinse, 1 mL/min strip, 22(1)°C.

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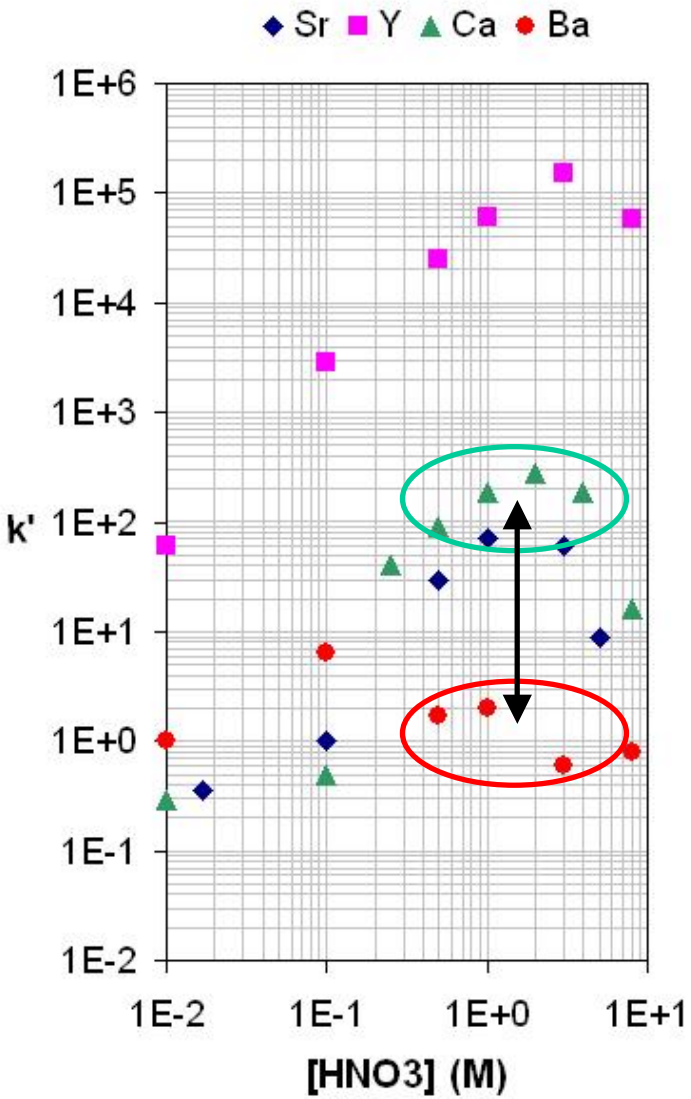
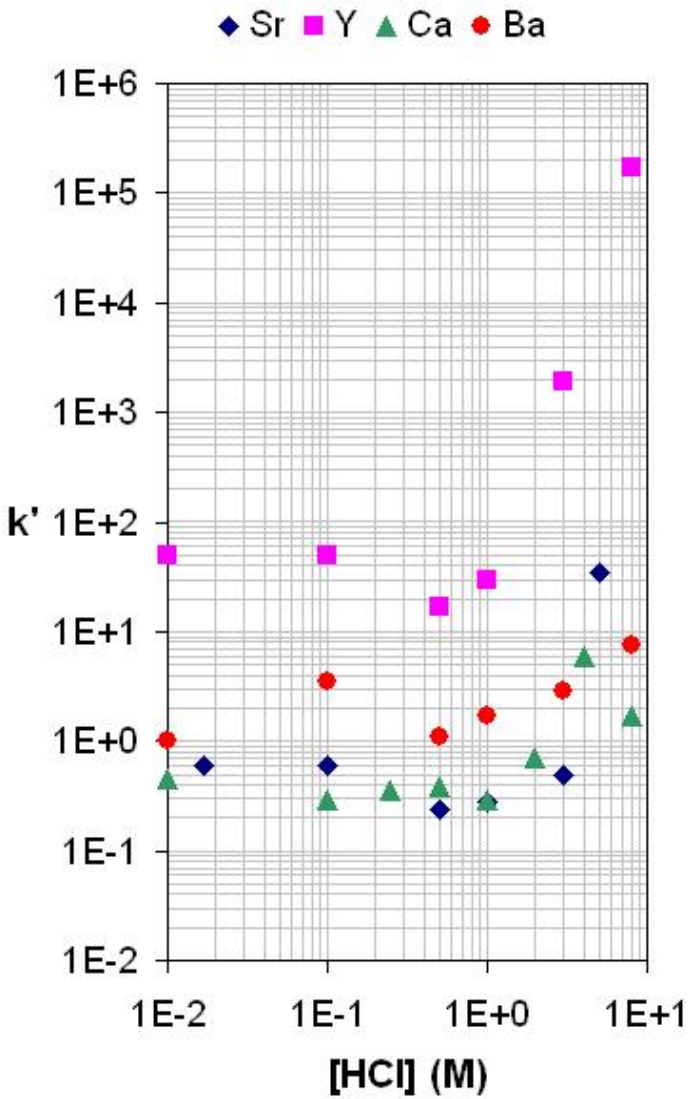
Strontium/Yttrium separation





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Strontium/Yttrium separation

- Sr/Ca: no separation
- Selective separation of Y at low HNO3 concentration from Sr/Ca
- Stripping of Y with 0.5M HCl
- Preparation of high purity Y and Sr with combining Sr and DGA, Normal resins

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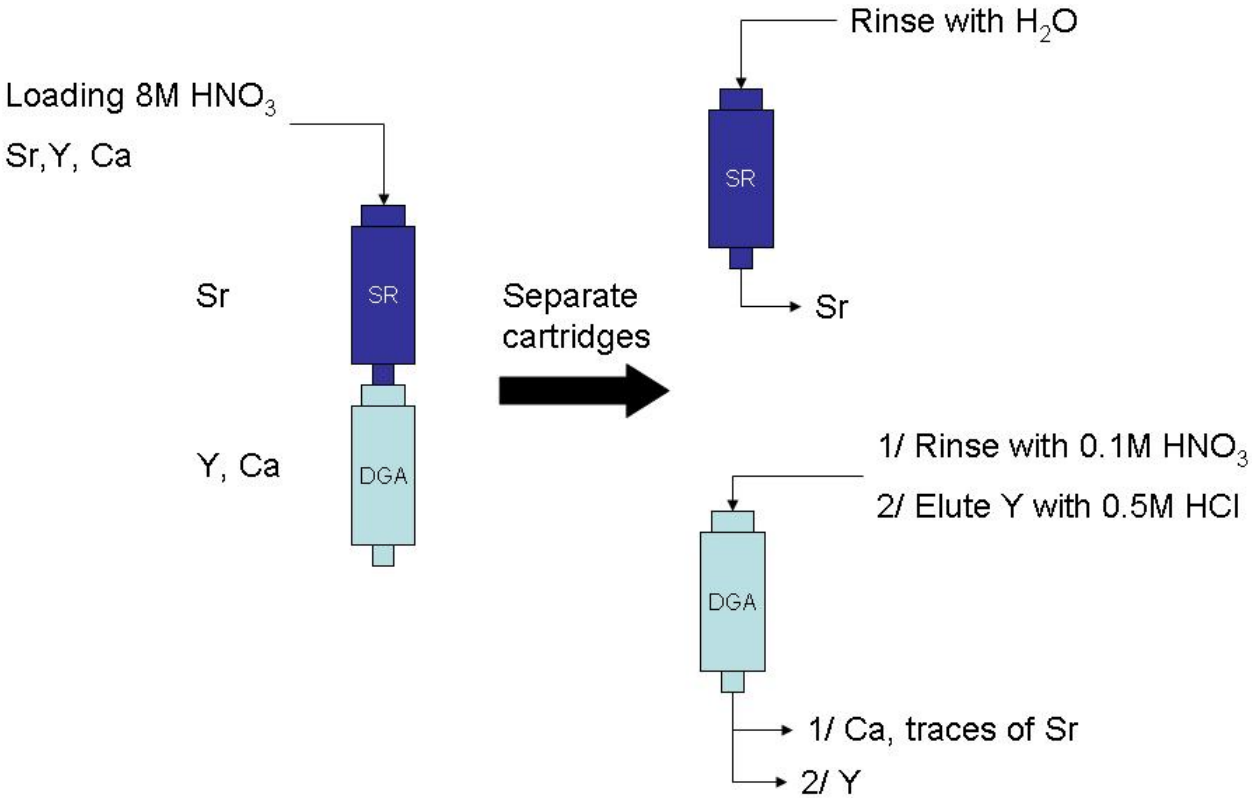

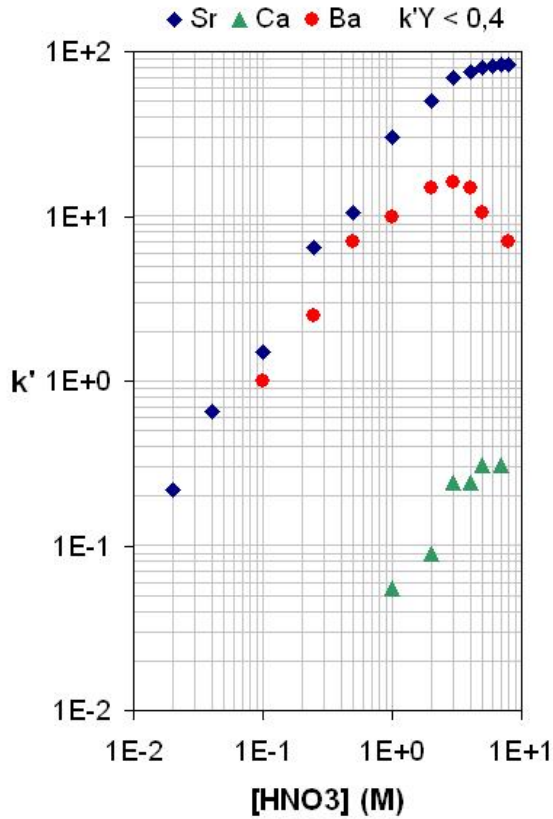

Sr Resin

Conclusion

- DGA resin effective for
  - Am separation
  - Ra/Ac separation
  - Y/Sr separation
- Use in combination: powerful tool for purification
  - Nuclear Medecine (^{90}Y production)