Extraction Chromatography Separation of Technetium-99

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Nuclear Metrology Group, National Physical Laboratory

Triskem User Group Meeting

Outline

- Existing procedures
- Results from new resins

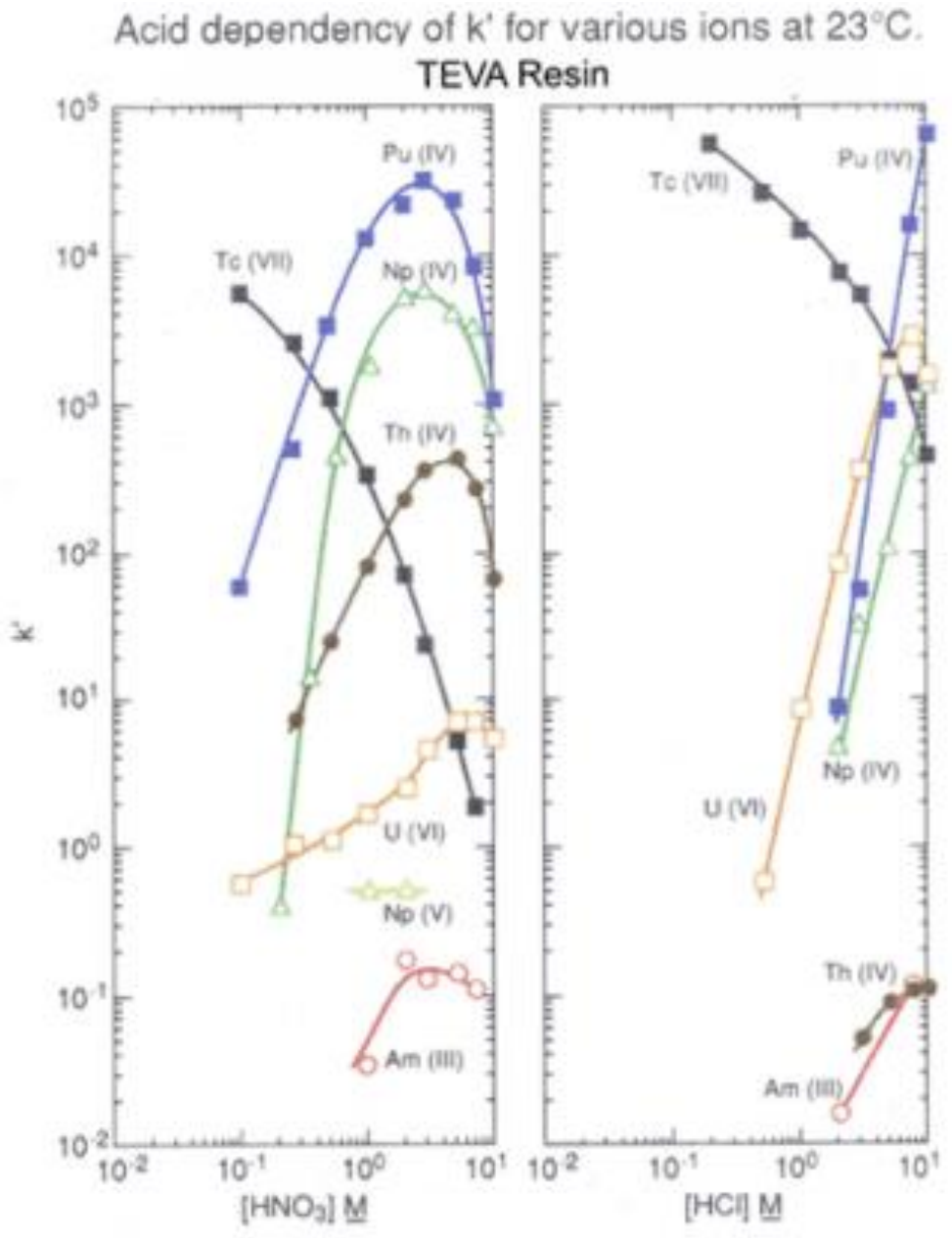
  TK200

  TK201

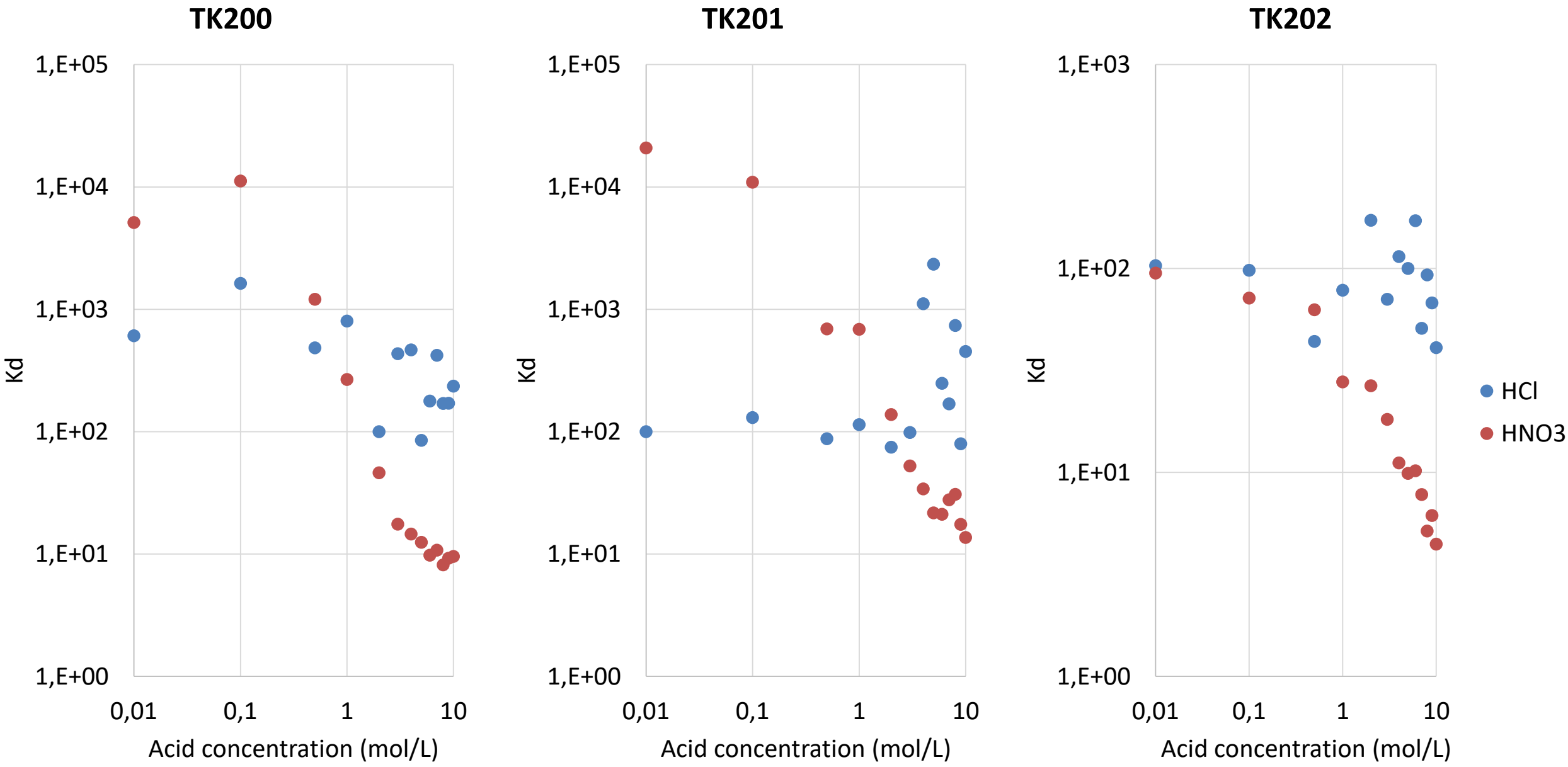
  TK202
- Future work

TEVA

- Separation of TEVA from actinides
- Tc-99 retained in 0.1-1 M HNO_3
- Eluted in 8M HNO_3
- Well established for LSC and ICP-MS



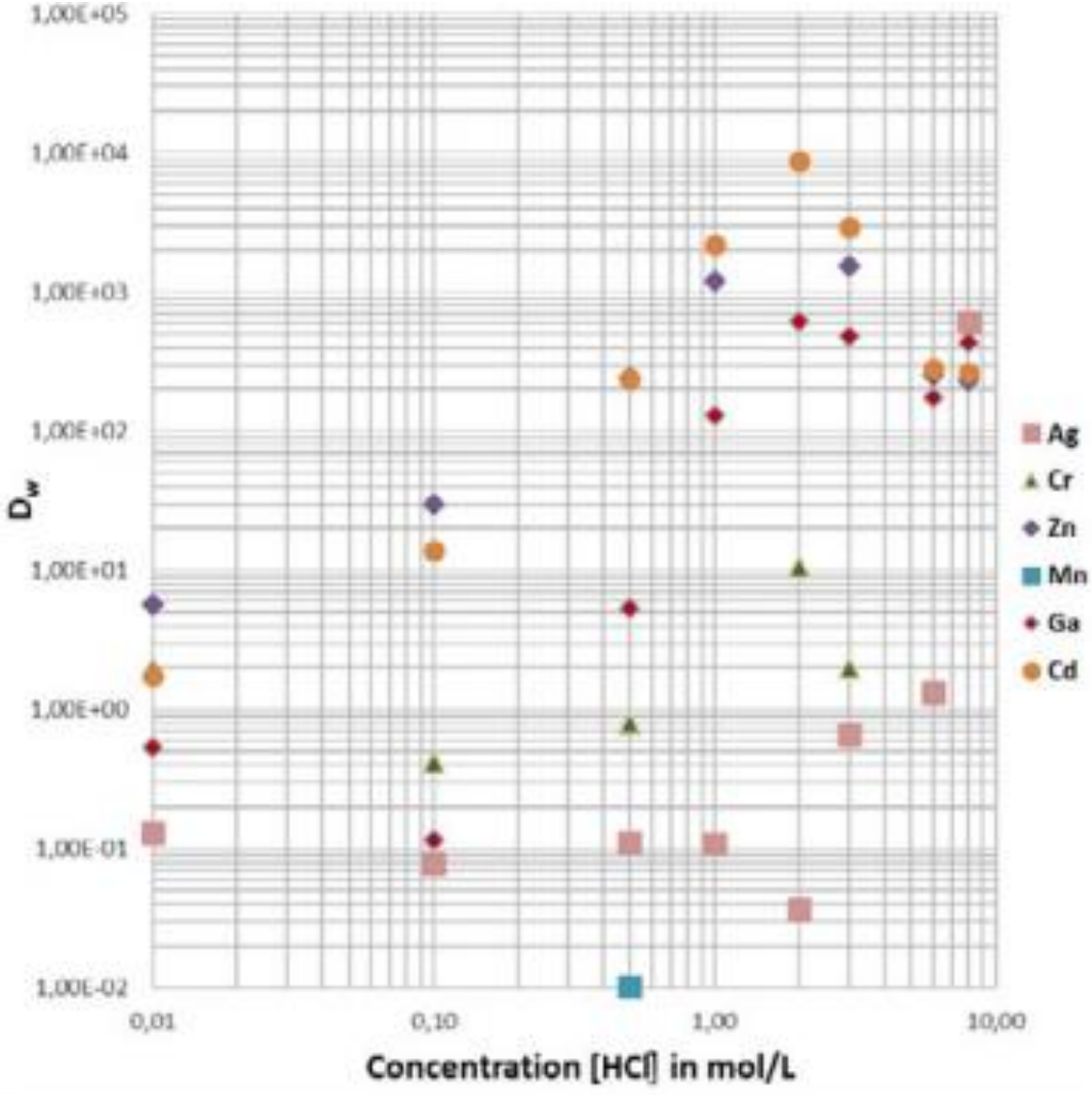
Tc-99 on new resins



TK200

- Based on TriOctylPhosphine Oxide (TOPO)
- Potential applications:
  - Separation of Ga isotopes (^{68}Ga) from irradiated Zn in combination with Zr-resin
  - Actinides (U, Th, Pu) in water samples

TK200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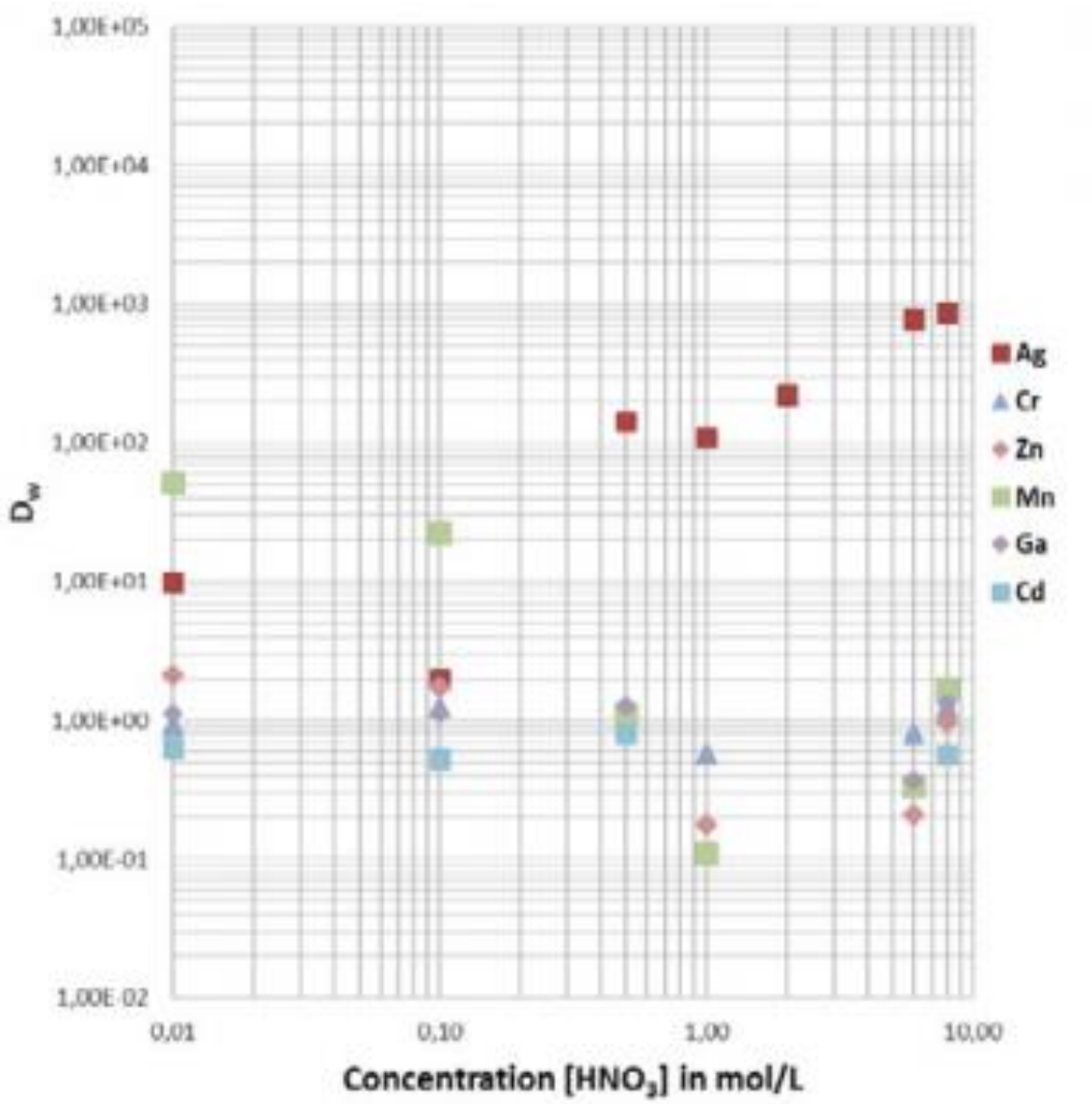
1,00E+04
1,00E+03
1,00E+02
1,00E+01
1,00E+00
1,00E-01
1,00E-02
D_w
0,01
0,10
1,00
10,00
Concentration [HCl] in mol/L
Ag
Cr
Zn
Mn
Ga
Cd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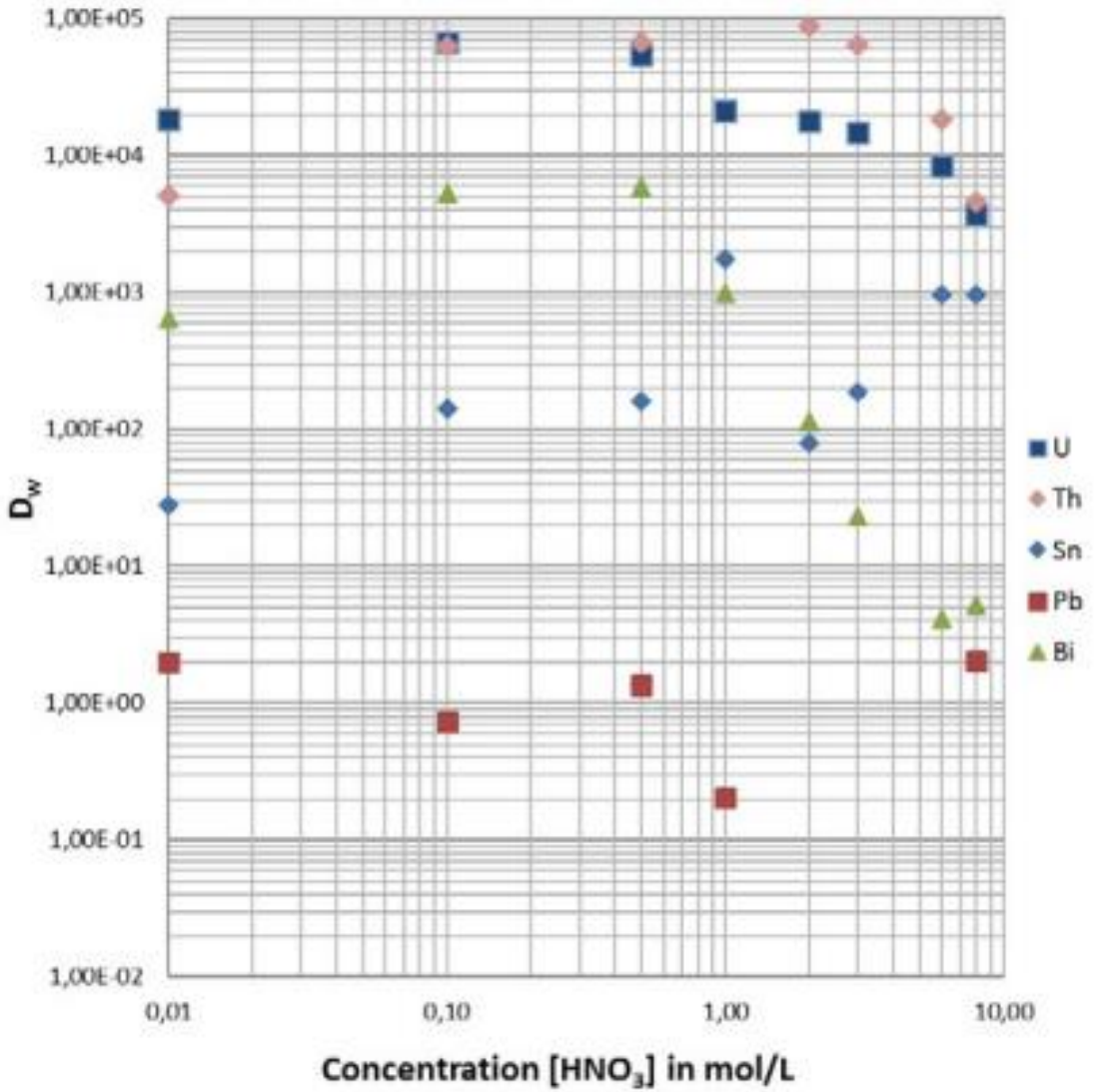
1,00E+03
1,00E+02
1,00E+01
1,00E+00
1,00E-01
1,00E-02
D_w
0,01
0,10
1,00
10,00
Concentration [HNO_3] in mol/L
Ag
Cr
Zn
Mn
Ga
Cd

TK200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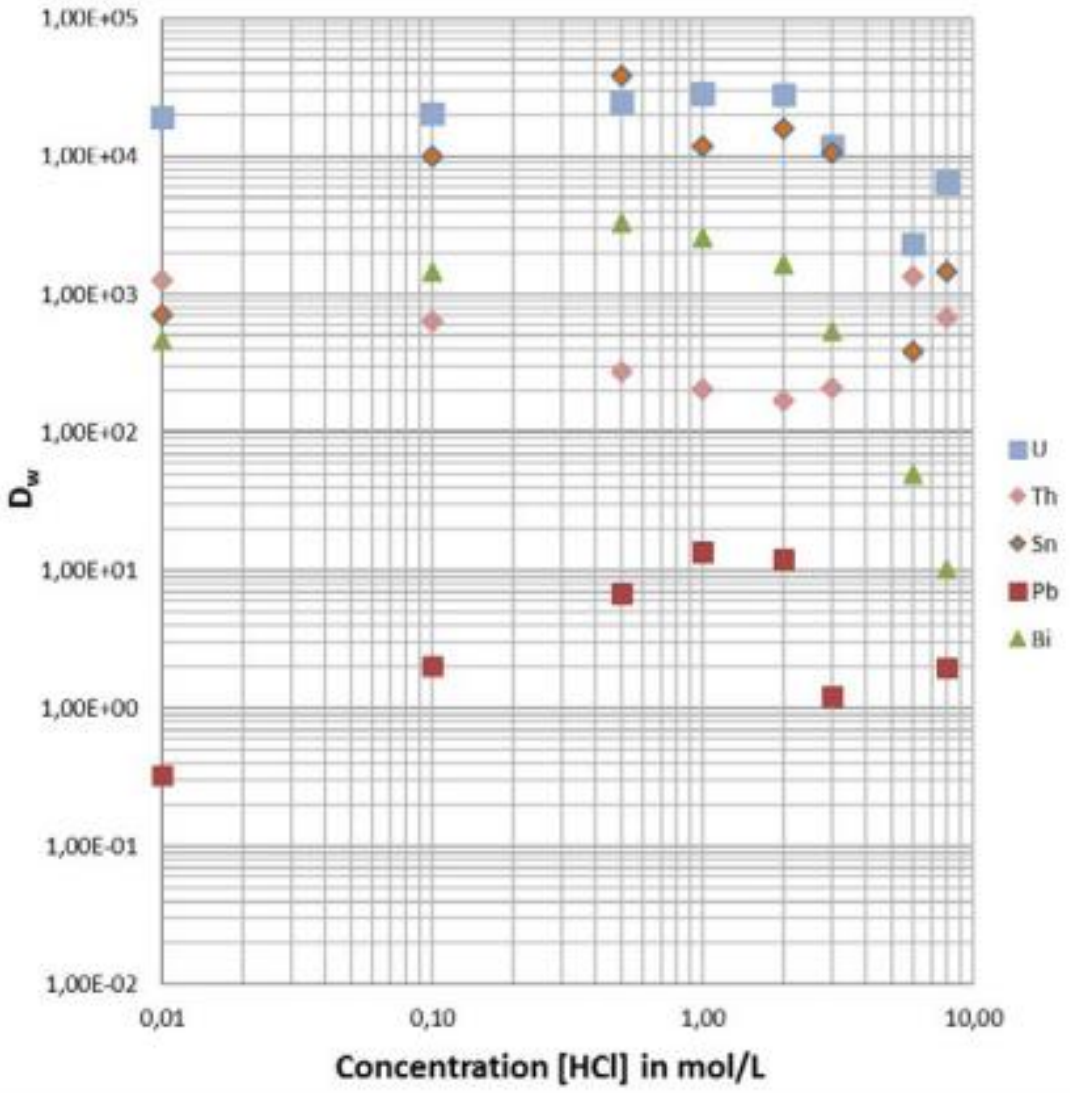
1,00E+00
1,00E-01
1,00E-02
D_w
0,01
0,10
1,00
10,00
Concentration [HNO_3] in mol/L
U
Th
Sn
Pb
Bi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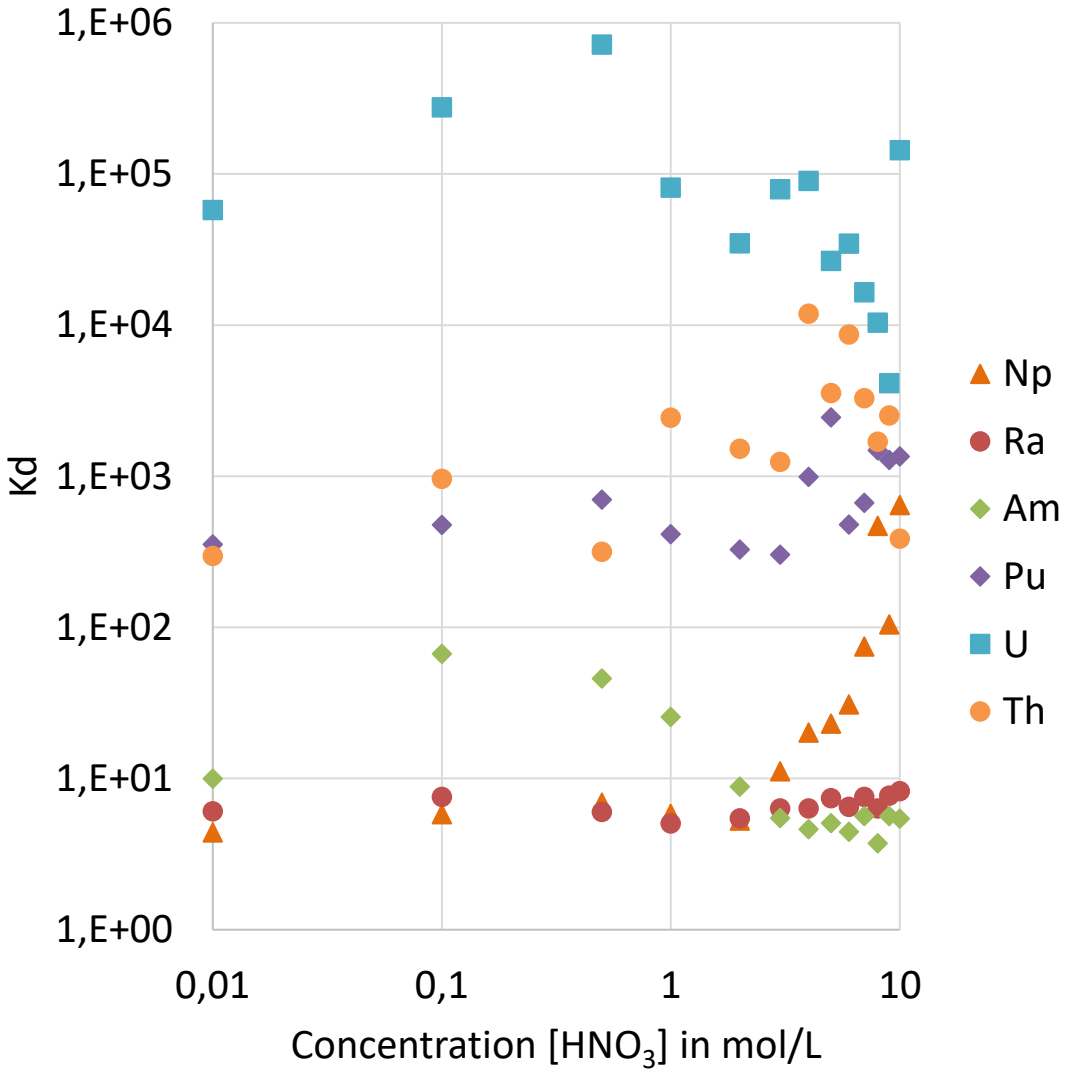
1,00E+02
1,00E+01
1,00E+00
1,00E-01
1,00E-02
D_w
0,01
0,10
1,00
10,00
Concentration [HCl] in mol/L
U
Th
Sn
Pb
Bi

TK200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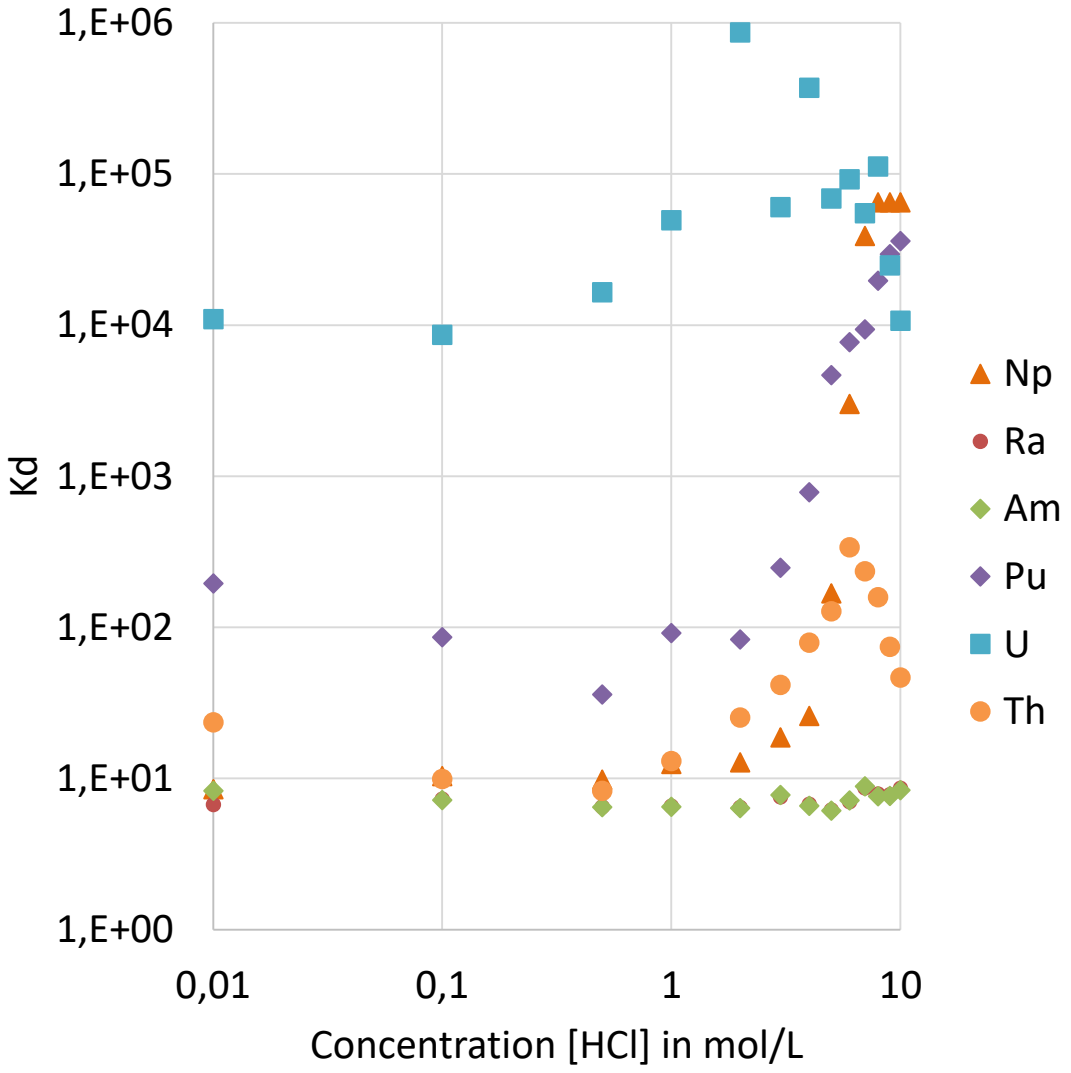
1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Np
Ra
Am
Pu
U
Th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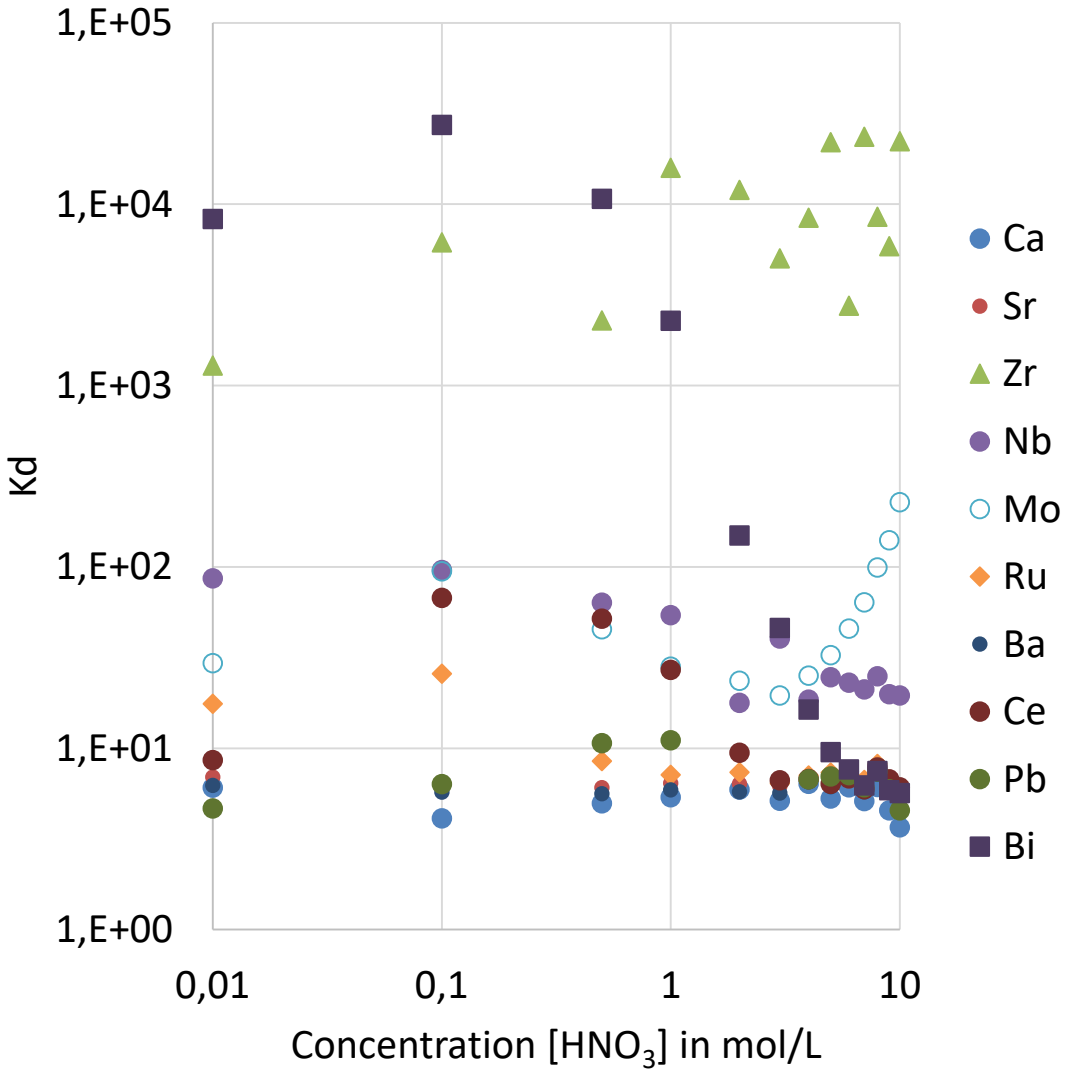
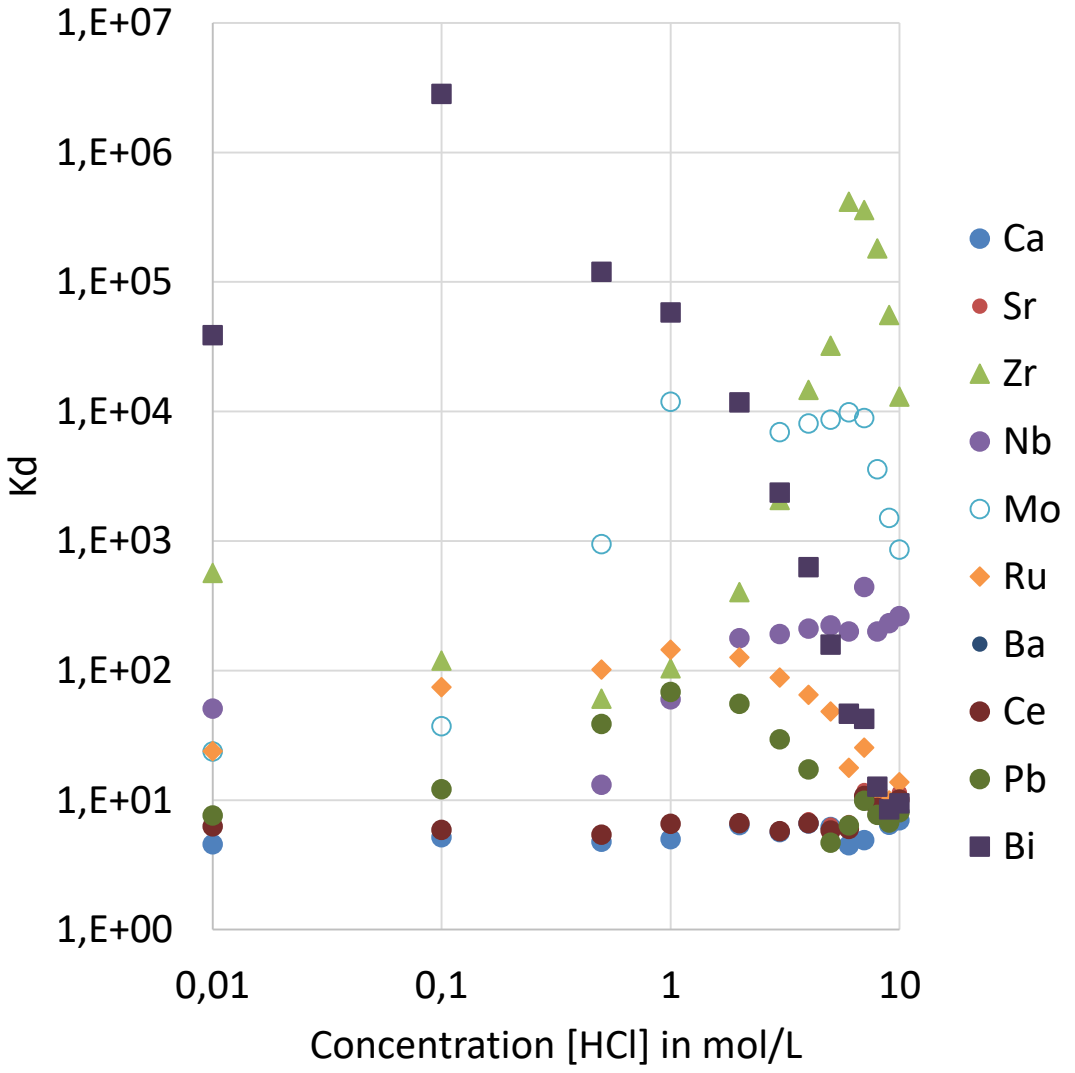
1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HCl] in mol/L
Np
Ra
Am
Pu
U
Th

TK200


1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Ca
Sr
Zr
Nb
Mo
Ru
Ba
Ce
Pb
Bi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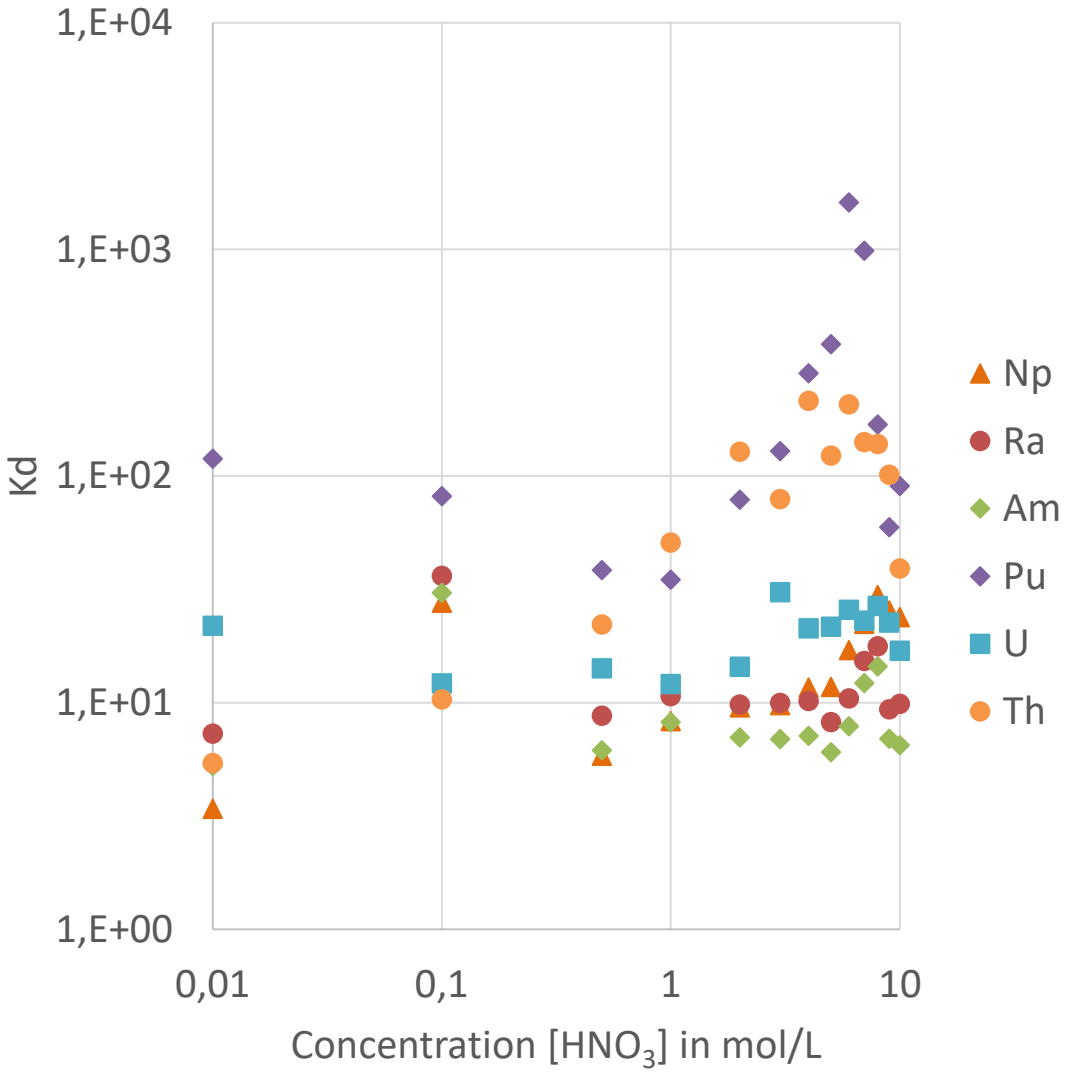
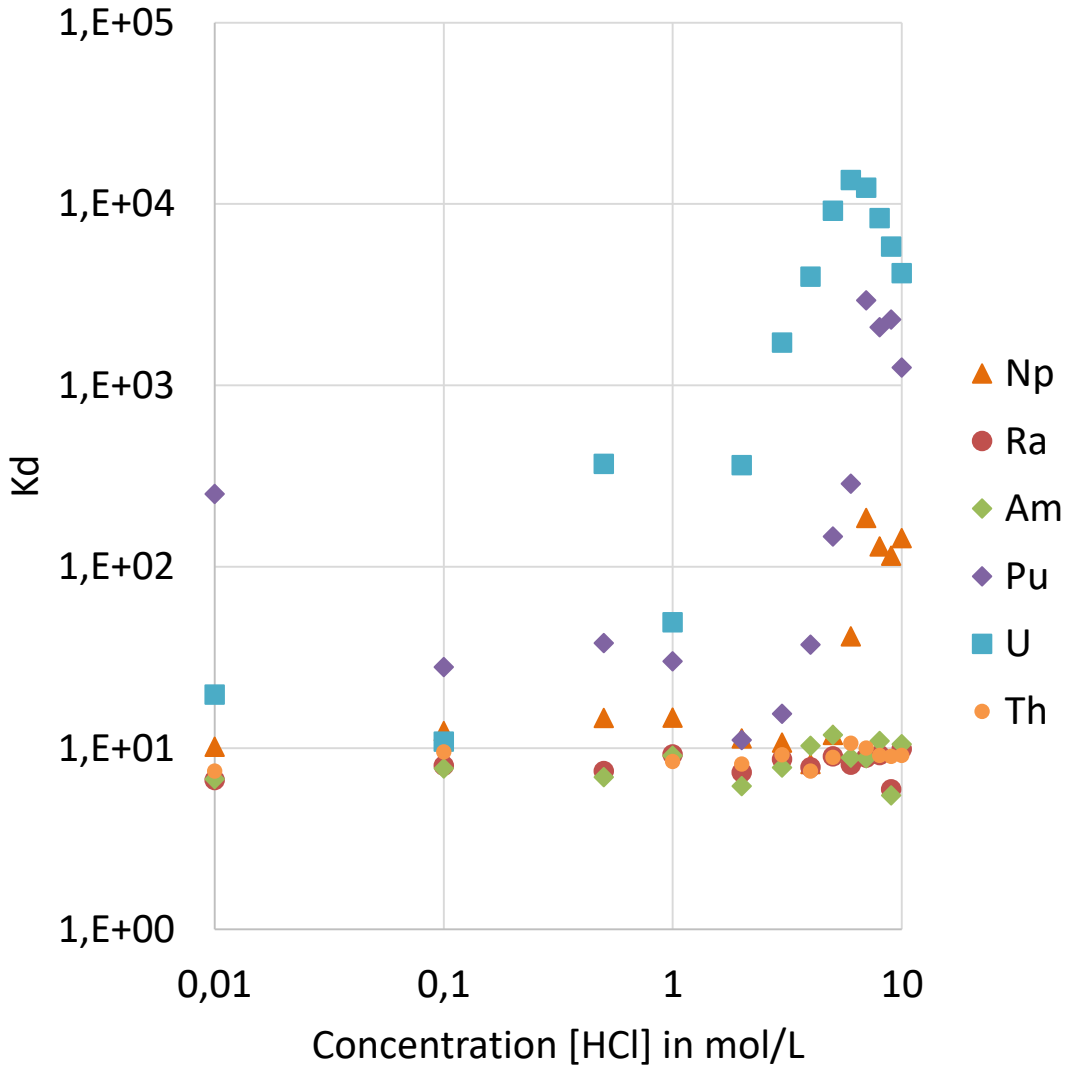
1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HCl] in mol/L
Ca
Sr
Zr
Nb
Mo
Ru
Ba
Ce
Pb
Bi

TK201


1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Np
Ra
Am
Pu
U
Th


1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
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Concentration [HCl] in mol/L
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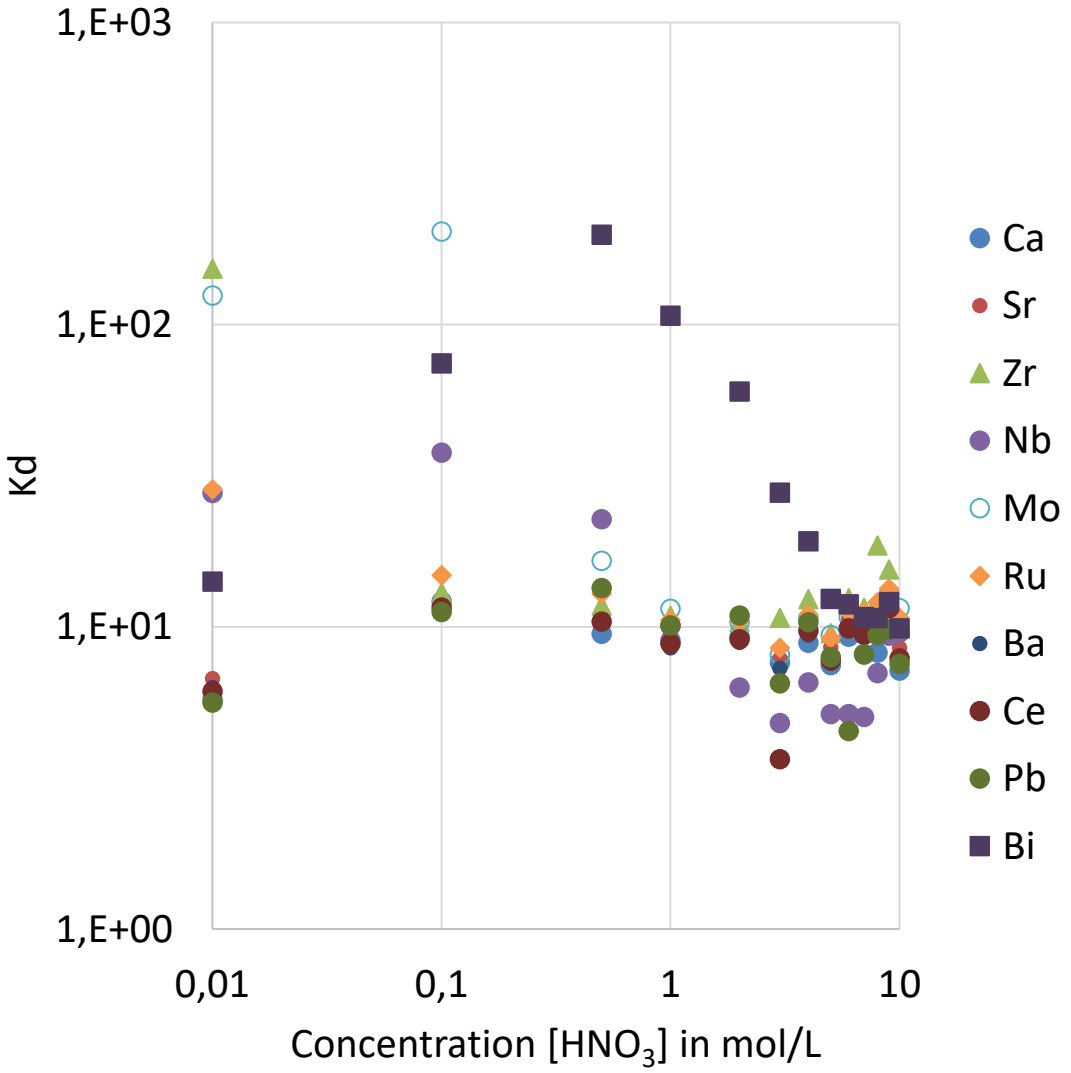
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Ca
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Nb
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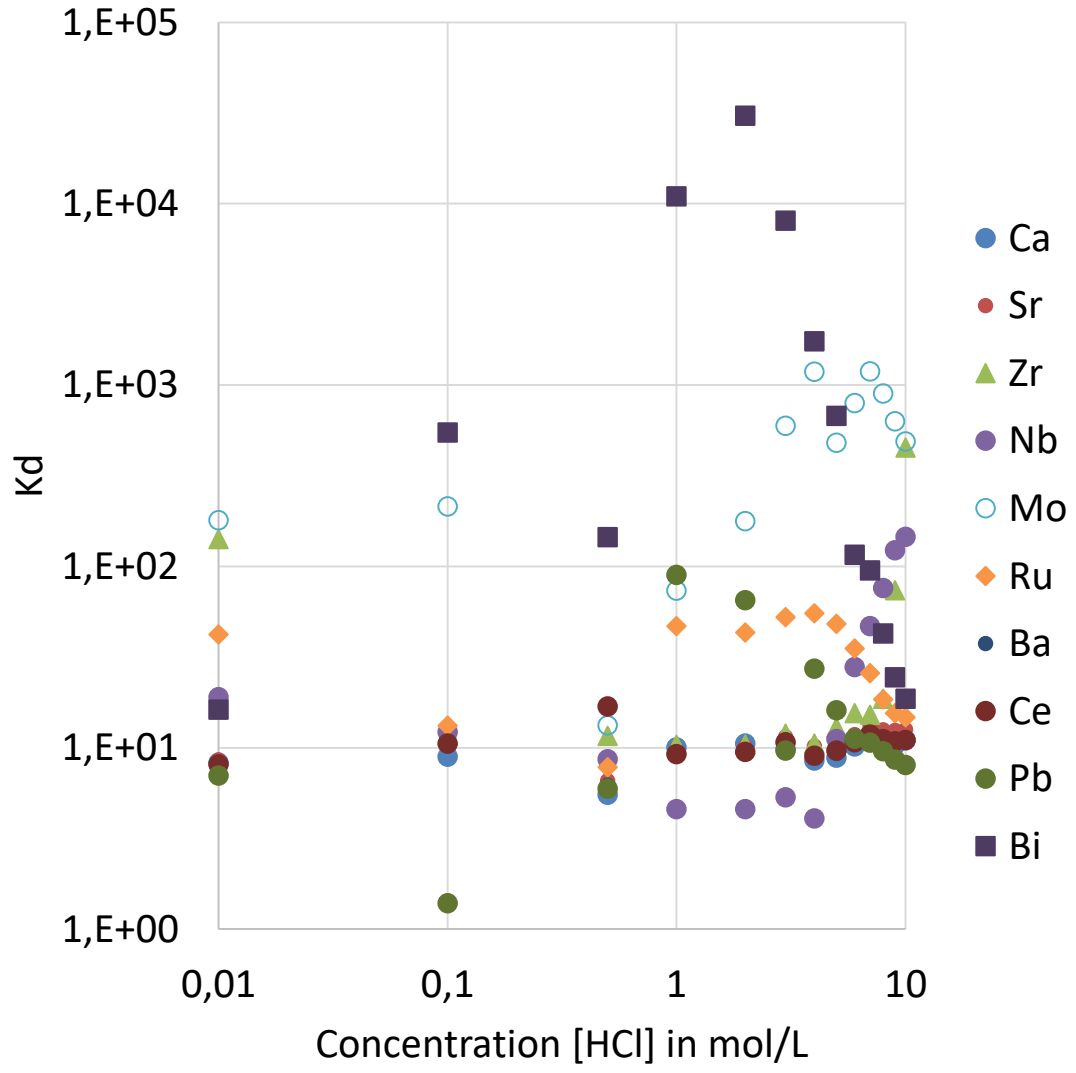
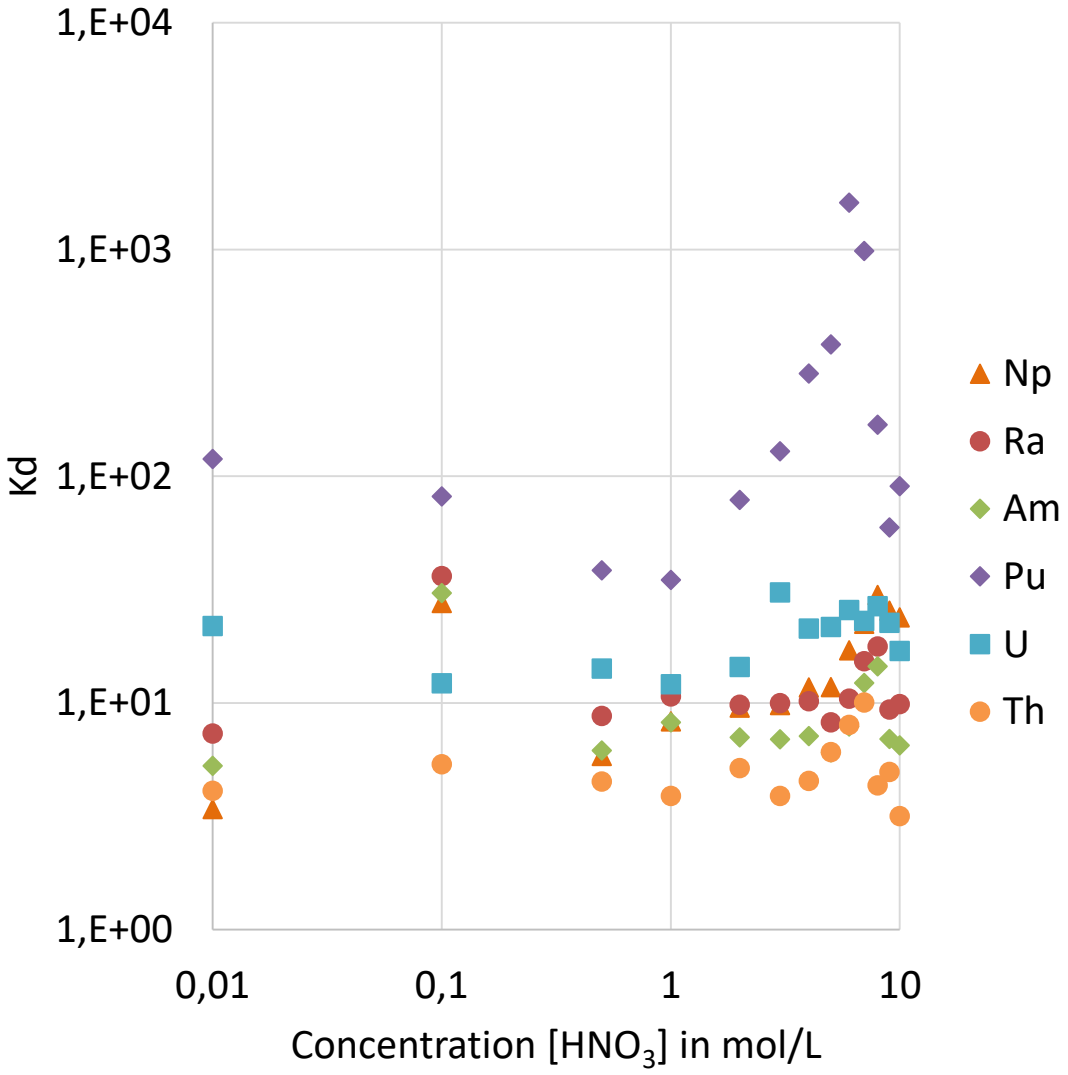
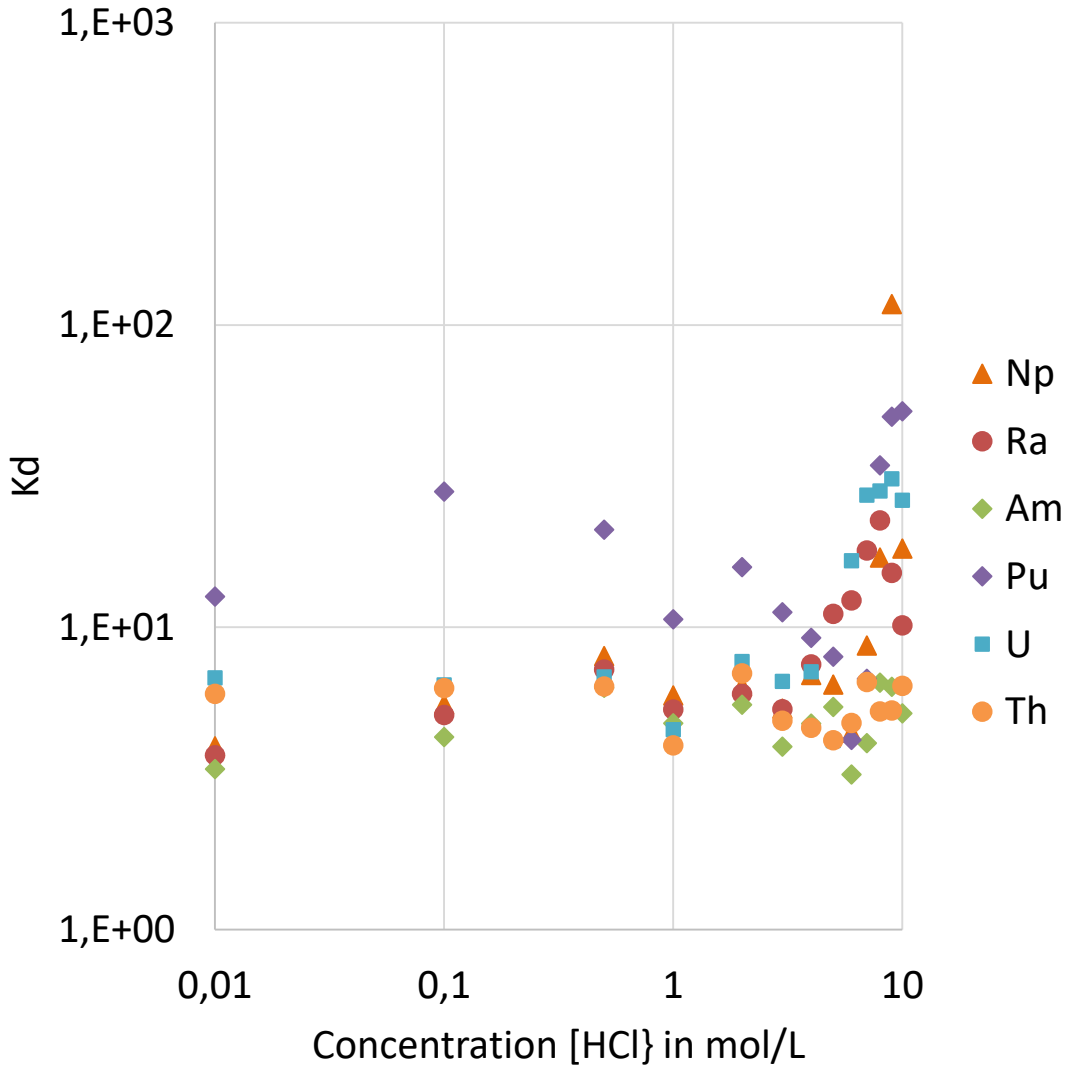
Ru
Ba
Ce
Pb
Bi


1,E+05
1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HCl] in mol/L
Ca
Sr
Zr
Nb
Mo
Ru
Ba
Ce
Pb
Bi

TK202


1,E+04
1,E+03
1,E+02
1,E+01
1,E+00
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Np
Ra
Am
Pu
U
Th


1,E+03
1,E+02
1,E+01
1,E+00
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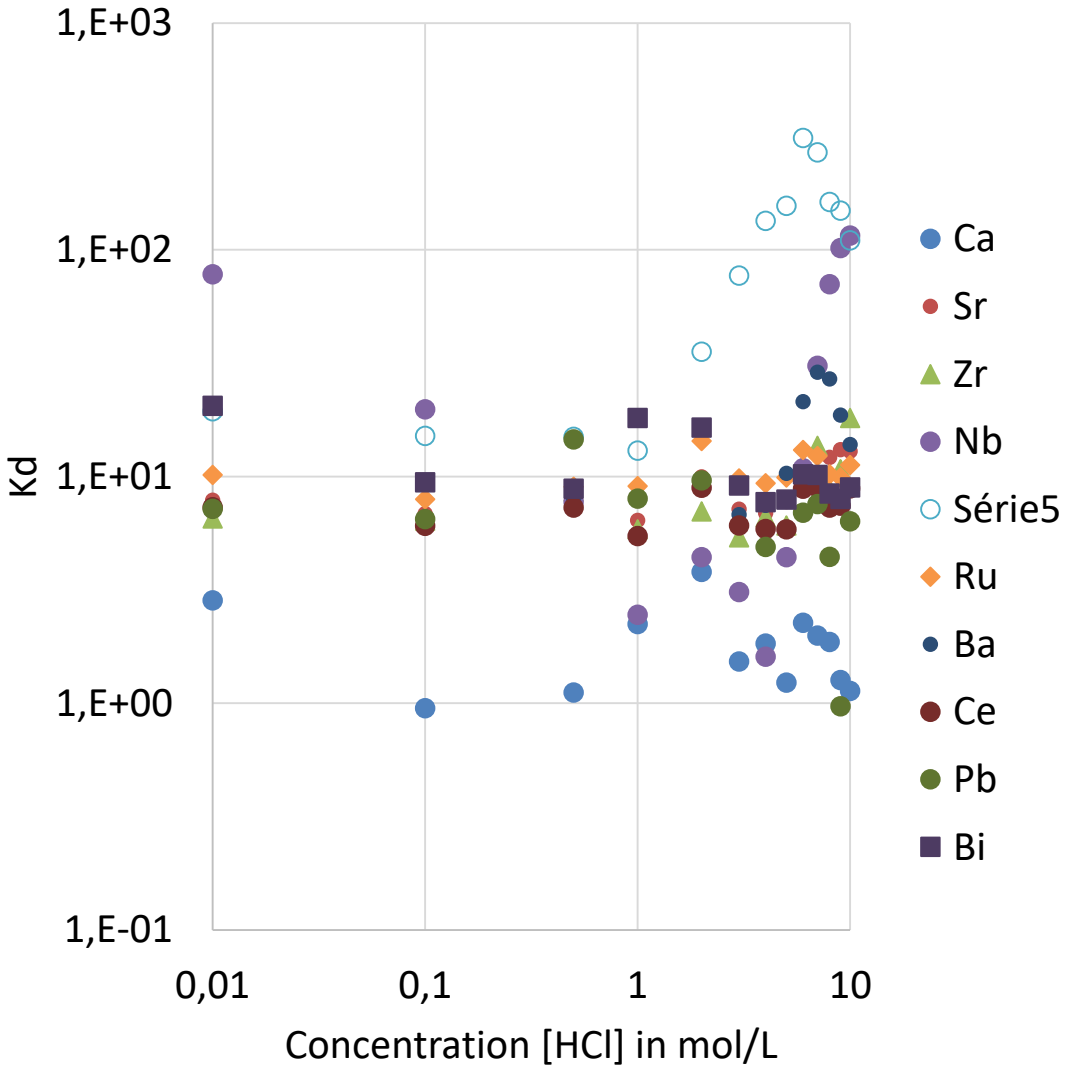
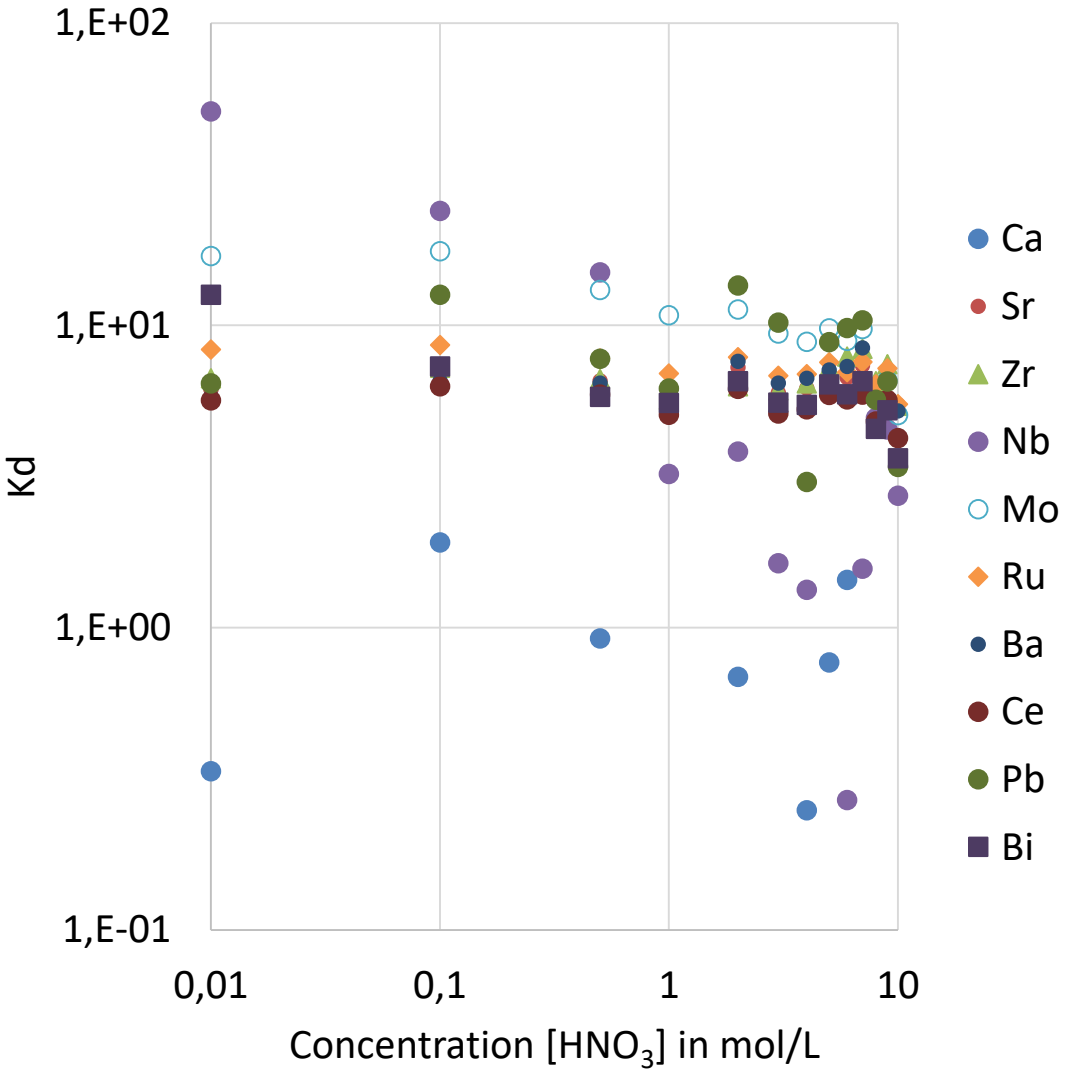
0,1
1
10
Concentration [HCl} in mol/L
Np
Ra
Am
Pu
U
Th

TK202


1,E+03
1,E+02
1,E+01
1,E+00
1,E-01
Kd
0,01
0,1
1
10
Concentration [HCl] in mol/L
Ca
Sr
Zr
Nb
Série5
Ru
Ba
Ce
Pb
Bi


1,E+02
1,E+01
1,E+00
1,E-01
Kd
0,01
0,1
1
10
Concentration [HNO3] in mol/L
Ca
Sr
Zr
Nb
Mo
Ru
Ba
Ce
Pb
Bi

Future Work

- Test further elution conditions for Tc-99 e.g. water, dilute NaOH
- Assess the resin tolerance for salinity, and capacity
- Investigation of additional reagents (NaOH, oxalic acid)
- Develop elution profiles for target nuclides using chromatographic separation
- Measure real samples using procedures developed

Thank you!

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