

**New Extraction Chromatographic Resins with
High Retention for Trivalent Lanthanides and
Actinides from Acidic Nitrate and Chloride Media**

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presented at the

27th Actinide

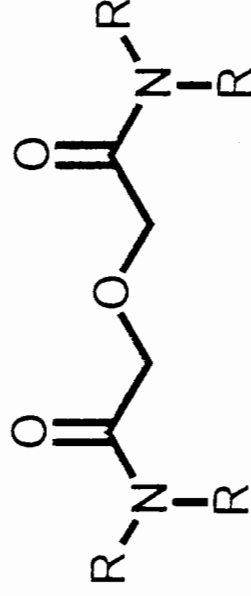
Separations Conference

June 9-12, 2003

Argonne National Laboratory
Argonne, Illinois

Diglycolamide (DGA) Resin

Extractant:



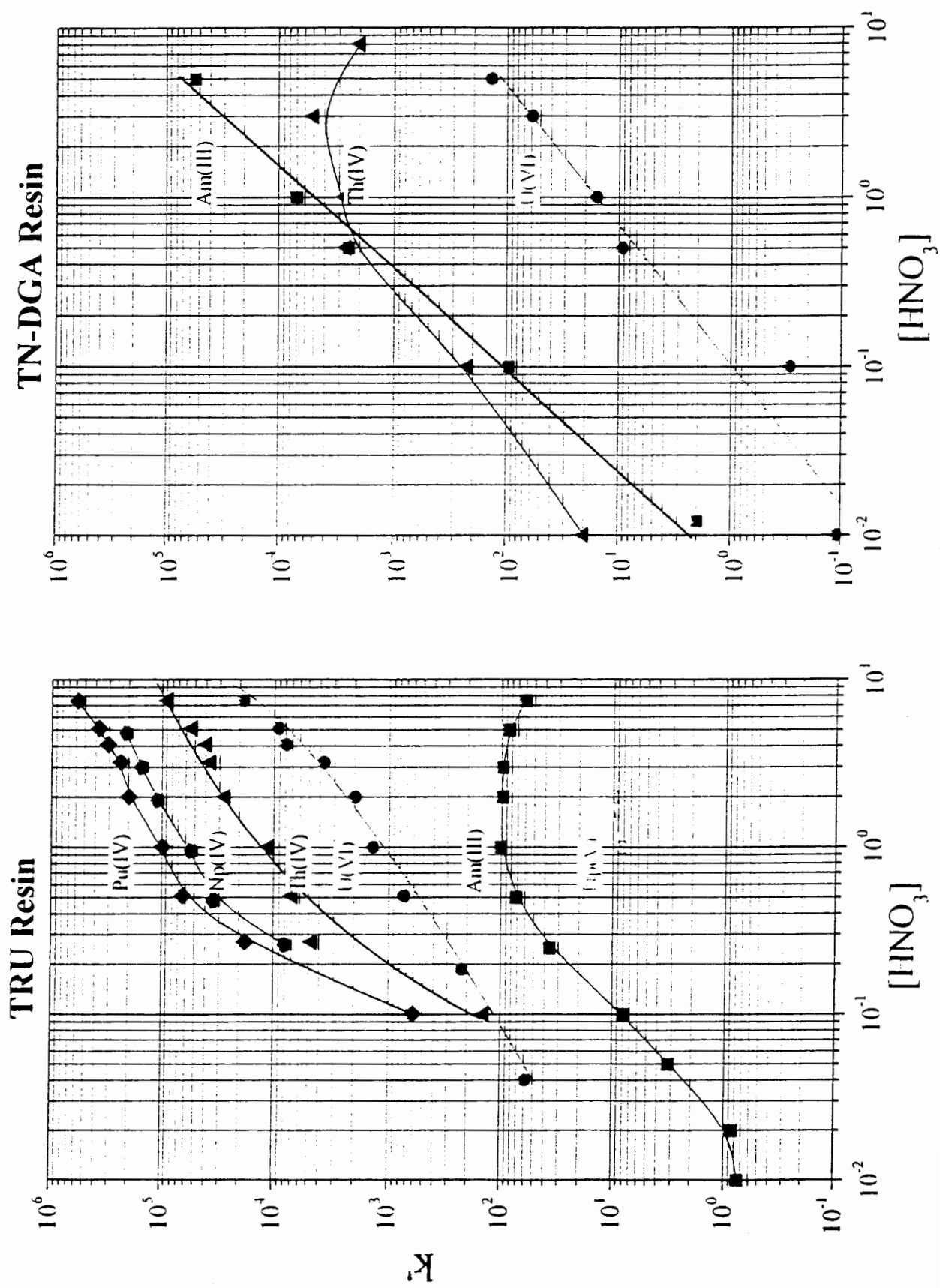
N,N,N',N'-tetra-*n*-alkyl-3-oxopentanediamide (TN-DGA)

N,N,N',N'-tetra-(branched-alkyl)-3-oxopentanediamide (TB-DGA)

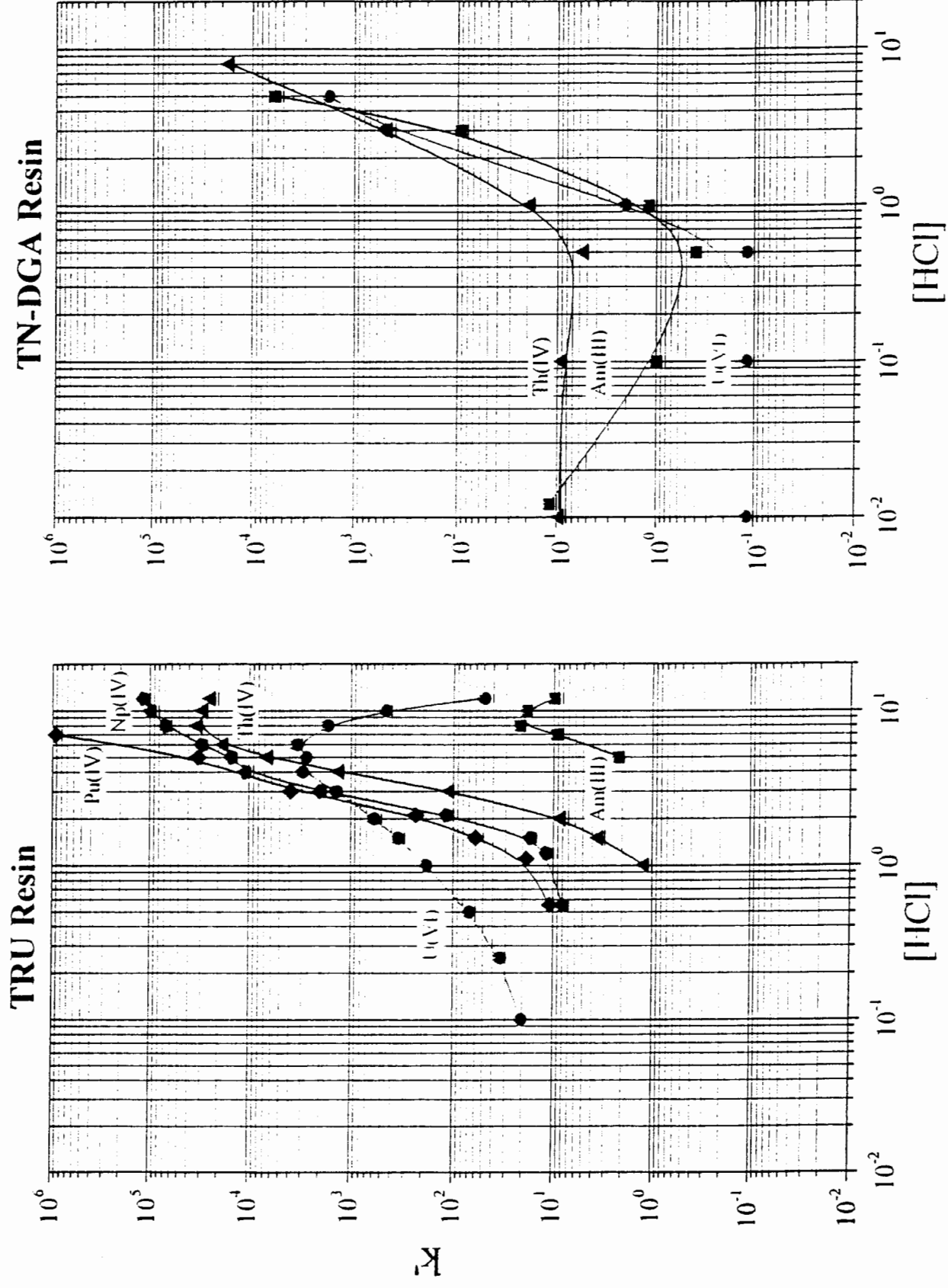
Presumed Extraction Equilibrium:



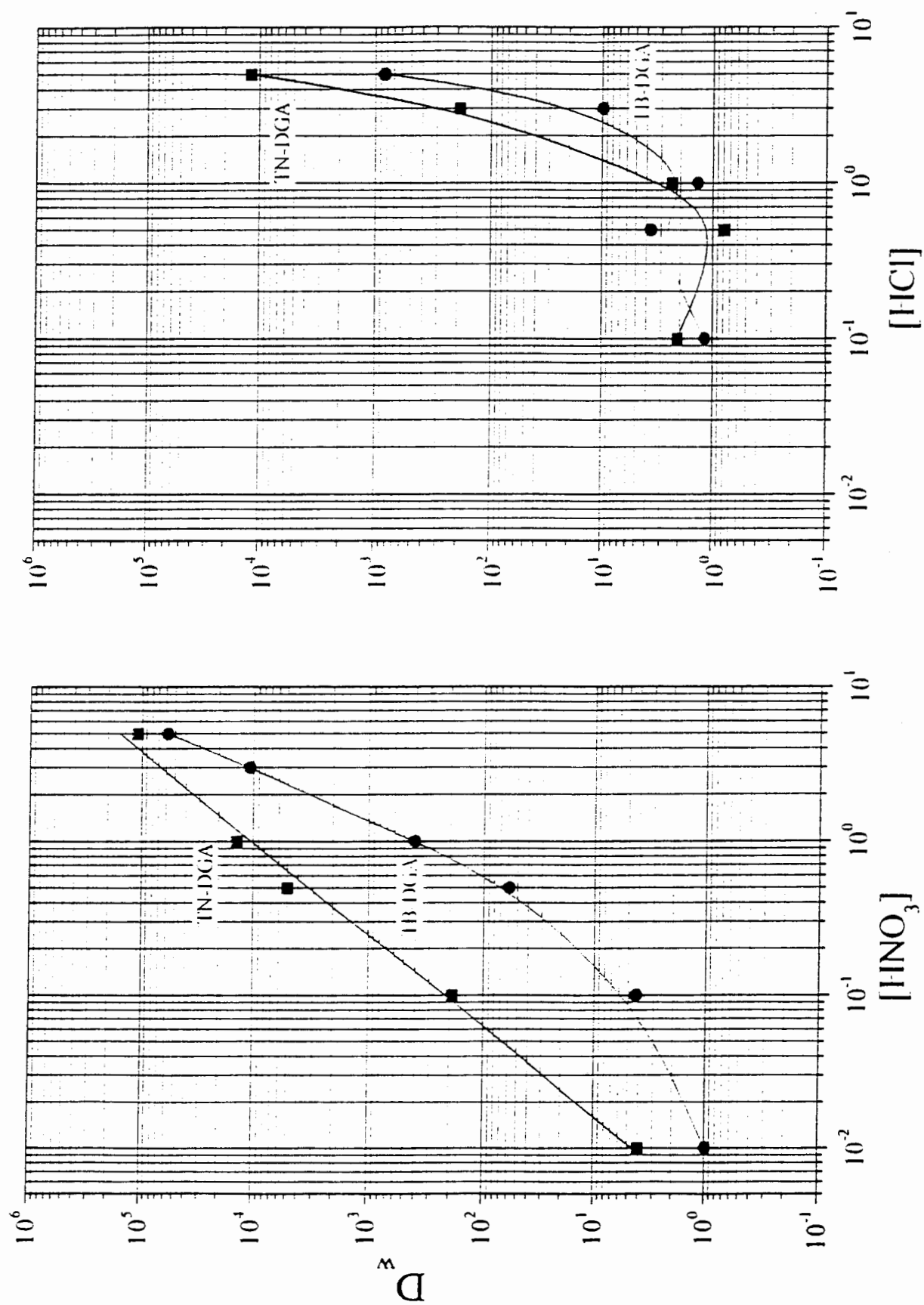
Comparison of TRU and DGA Resins



Comparison of TRU and DGA Resins



Comparison of TN-DGA and TB-DGA Resins



Elution of selected cations on
TN-DGA resin.

Fraction	Bed Vols.	Percent of Total					
		Ba(II)	Cd(II)	Cu(II)	Fe(III)	Y(III)	Zr(IV)
Load (4 M HNO ₃)	20	90	93	95	92	0	0.9
Rinse (0.5 M HNO ₃)	2.0	10	7	3.5	7	0	0.2
	2.0	< 0.1	< 0.1	0.4	0.6	0	0
	2.0	< 0.1	0	0.4	< .1	0	0
	2.0	0	0	0.4	0.4	0	0
	2.0	0	0	< 0.1	0	0	0
Strip (0.01 M HCl)	2.0	0	0	0	0	71	5
	2.0	0	0	0	0	27	10
	2.0	0	0	0	0	1	11
	2.0	0	0	0	0	0.7	10
	2.0	0	0	0	0	0.3	10

Column bed volume = 0.5 mL, flow rate = 0.5 mL/minute for
load and

0.25 mL/minute for wash and strip

Elution Behavior of Selected Cations
on TN-DGA Resin*

Fraction	Bed Volume	Percent of Total			
		Al(III)	Y(III)	Th(IV)	U(VI)
Load (0.5 <u>M</u> HNO ₃)	2.0	66	0	0	0
Rinse (0.1 <u>M</u> HNO ₃)	2.0	28	0	0	75
	2.0	0	0	0	8.4
	2.0	0	0	0	0
	2.0	0	0	0	0
	2.0	0	0	0	0
Strip (0.1 <u>M</u> HCl)	2.0	0	24	78	0
	2.0	0	76	16	0
	2.0	0	0	0	0
	2.0	0	0	0	0
	2.0	0	0	0	0

*Bed volume = 0.5 mL; Flow rate = 0.1
mL/minute for load, rinse, and strip

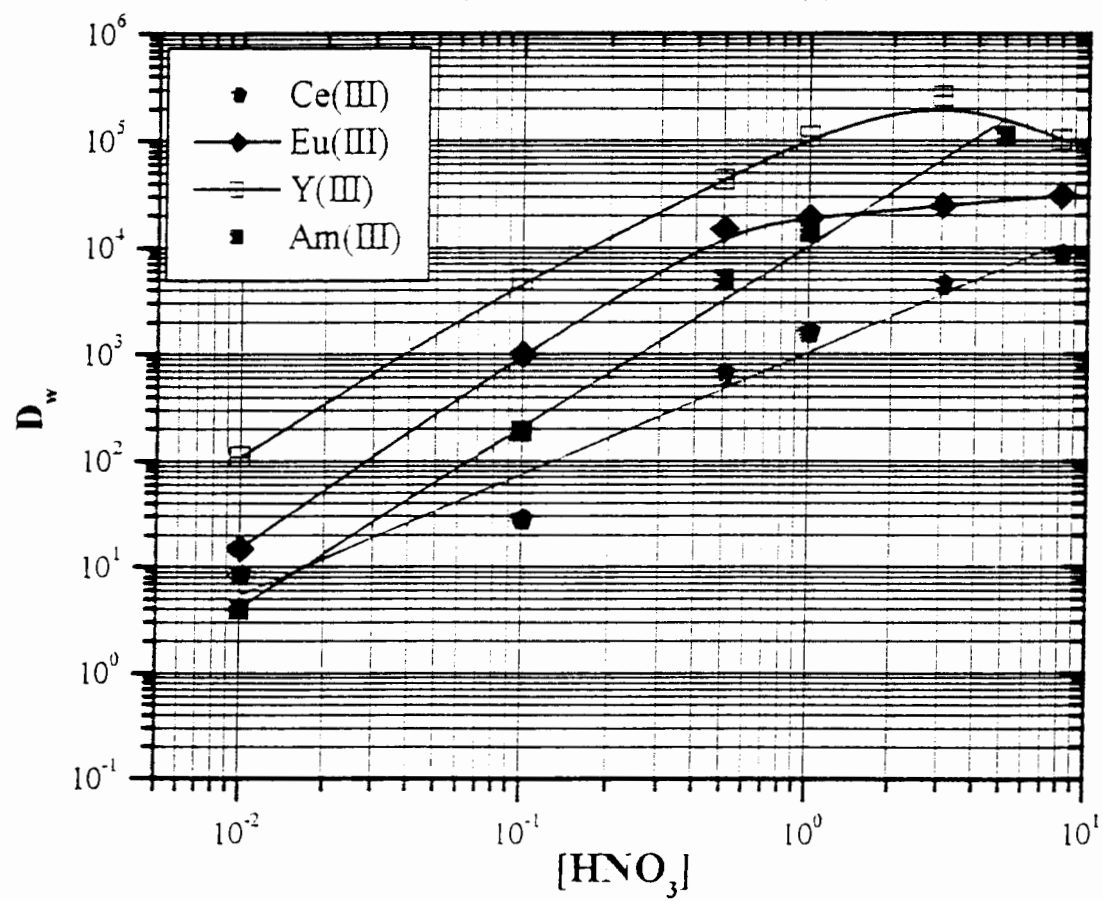
Elution of selected cations on
TN-DGA resin

Fraction	Bed Vols.	Percent of Total			
		Mg(II)	Ca(II)	Sr(II)	Ba(II)
Load (4 M HNO ₃)	10	94	1.1	0	96
Rinse	2	2.6	<0.1	1.2	4
(0.5 M HNO ₃)	2	0.5	0	96	0
	2	0.2	0.1	2.4	0
	2	0.8	0.2	0.4	0
	2	0.5	0.2	<0.1	0
Rinse	2	0.1	28	<0.1	0
(0.1 M HNO ₃)	2	0.1	63	0	0
	2	0.1	3.4	0	0
	2	0	1.1	0	0
	2	0	1.1	0	0
Strip	4	0.1	1.1	0	0
(0.1 M HCl)	4	0.1	1.1	0	0

Column bed volume = 0.5 mL, flow rate = 0.5 mL/minute
for load and 0.25 mL/minute for wash and strip

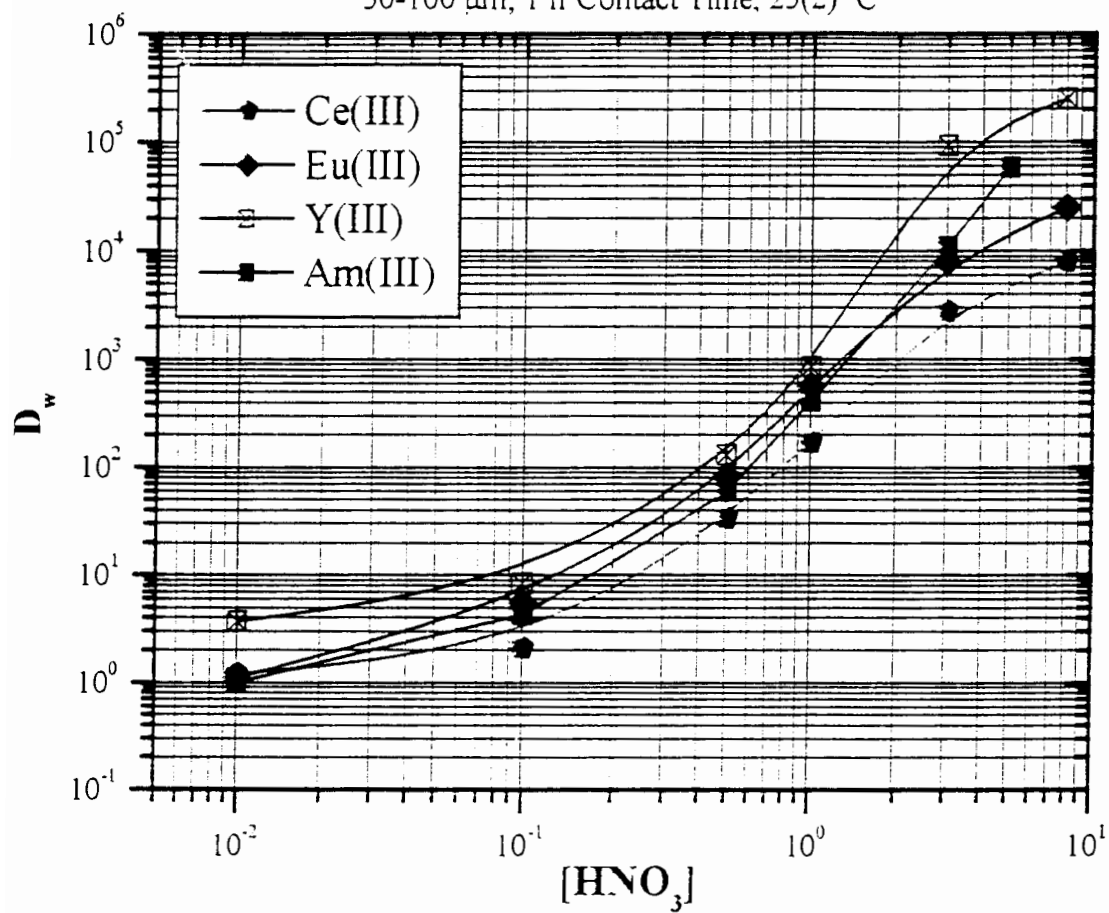
D_w vs. HNO_3 for TN-DGA Resin

50-100 μm , 1 h Contact Time, 25(2) $^{\circ}C$



D_w vs. HNO_3 for TB-DGA Resin

50-100 μm , 1 h Contact Time, 25(2) $^{\circ}C$



Application of DGA Resins for the Removal of TRUs and Ln F.P.s from Purex Raffinate

