

SC-Database

Software version = 5.81 Data version = 4.62

Experiment list contains 275 experiments for

(no ligands specified)

4 metals : Pu⁺⁺⁺, Pu⁺⁺⁺⁺, PuO₂⁺, PuO₂⁺⁺

(no references specified)

(no experimental details specified)

e- HL Electron (442)

Electron;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu ⁺⁺⁺	oth	none	25°C	0.0	U				1952LAb	(841) 1

K(Pu+3e=Pu(s))=-103(-2030 mV)

From thermodynamic data

Br- HL Bromide CAS 10035-10-6 (19)

Bromide;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu ⁺⁺⁺	sp	oth/un		var	U			K1=-3.45 B2=-6.54	1966SMd	(2280) 2

Medium:LiBr var

Cl- HL Chloride CAS 7647-01-0 (50)

Chloride;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu ⁺⁺⁺	sp	KCl	?	var	U			K1=-2.43 B2=-5.00	1966SMd	(5580) 3

Medium:LiCl var

Pu ⁺⁺⁺	cal	NaCl04	25°C	0.10M	U	H		K1=0.57	1958MWa	(5581) 4
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Medium: HCl04. DH(K1)=19 kJ mol⁻¹, DS=75 J K⁻¹ mol⁻¹

Pu ⁺⁺⁺	ix	none	?	0.0	U			K1=1.17	1956WWa	(5582) 5
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Pu ⁺⁺⁺	EMF	NaCl04	25°C	1.0M	U			K1=-0.15	1953CMb	(5583) 6
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F- HL Fluoride CAS 7644-39-3 (201)

Fluoride;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu ⁺⁺⁺	sol	oth/un	25°C	var	U				1961MFa	(7121) 7

Kso(PuF3)=-15.6

NO₃- HL Nitrate CAS 7697-37-2 (288)

Nitrate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	dis	NaClO4	20°C	8.0M	U		K1=1.18 B2=0.07 B3=-0.72	1970LKa (9880)	8

Medium: HClO4

Pu+++	dis	NaClO4	20°C	1.0M	U	M	K1=0.77 B2=1.16 B3=1.16	1959STa (9881)	9
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Medium: HClO4. $K_d(\text{Pu}+3\text{L}+3\text{TBP}(\text{C}_6\text{H}_6)=\text{PuL}_3(\text{TBP})_3(\text{C}_6\text{H}_6))=-0.12$

OH-
Hydroxide; HL Hydroxide (57)

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaClO4	25°C	1.0M	U		K(PuOH+H)=5.54	1982NCa (12006)	10

Pu+++	gl	none	25°C	0.0	U	T H	*K1=-8.0	1980LTb (12007)	11
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60 C: *K1=-7.0. 100 C: -6.1. 150 C: -5.2. 200 C: -4.5

Evaluated data

Pu+++	gl	oth/un	?	var	U		Kso(Pu(OH)3)=-19.7	1950BCa (12008)	12
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Pu+++	gl	none	25°C	0.0	U		*K1=-6.95	1949KDa (12009)	13
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P04--- H3L Phosphate CAS 7664-38-2 (176)
Phosphate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	EMF	none	25°C	0.0	U	T H	K(Pu+HPO4+H)=9.7	1980LTb (13308)	14

100 C: K=11; 200 C: K=13. Evaluated data

Pu+++	ix	R4N.X	20°C	1.00M	U		K1=19.3 K(Pu+H2L)=1.48 K(Pu+2H2L)=2.20 K(Pu+3H2L)=2.90 K(Pu+4H2L)=3.5	1971M0d (13309)	15
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Medium:NH4Cl. Kso=-24.4

Pu+++	oth	none	?	0.0	U		K1=22.0 K(Pu+H2L)=2.39 K(Pu+2H2L)=3.70	1969M0c (13310)	16
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K(Pu+3H2L)=5.63

K(Pu+4H2L)=6.2

Methods :solubility, ion exchange, distribution, EMF

SCN- HL Thiocyanate CAS 463-56-9 (106)
Thiocyanate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	dis	NaClO4	25°C	2.0M	U		K1=0.33 B2=0.03	1978RBb (15237)	17
Pu+++	dis	R4N.X	30°C	1.00M	U	T	K1=0.34 B2=0.61	1974KMa (15238)	18
Medium: NH4ClO4/NH4SCN, pH 2.8									
Pu+++	oth	NaClO4	25°C	3.0M	U	T	K1=0.04 B2=-0.10 K3=-0.6	1966CMA (15239)	19

Method: cation exchange

Pu+++	dis	NaClO4	25°C	1.0M	U	T	K1=0.46 B2=0.75	1965CKb (15240)	20
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SO4-- H2L Sulfate CAS 7664-93-9 (15)
Sulfate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	EMF	none	25°C	0.0	U	T H	K1=3.5	1980LTb (16488)	21
60 C: K1=3.9; 100 C: K1=4.4; 200 C: K1=6.1. Evaluated data									
Pu+++	dis	NaClO4	25°C	1.0M	U	I		1978RBa (16489)	22
							K(Pu+HL)=0.81 K(Pu+2HL)=0.68		
Pu+++	ix	NaClO4	25°C	1.00M	U		K1=1.73 B2=3.39	1976FBa (16490)	23
Pu+++	ix	NaClO4	25°C	2.00M	U		K1=1.65 B2=3.29 K(Pu+HSO4=PuSO4+H)=3.74 K(Pu+2HSO4=Pu(SO4)2+2H)=13.66	1976FBa (16491)	24
Pu+++	ix	NaClO4	28°C	1.0M	U		K1=1.26 K(Pu+2HL)=1.00	1967NRb (16492)	25

Medium: HClO4

CH2O2 HL Formic acid CAS 64-18-6 (37)
Methanoic acid; H.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaClO4	25°C	1.0M	C		K1=1.44	1981NJa (17643)	26

C2H2O4 H2L Oxalic acid CAS 144-62-7 (24)

Ethanedioic acid; (COOH)₂

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	sol	oth/un	?	?	U	H	K1=9.31 B2=18.70 K3=9.92	1957GMb (19040)	27

DH(K1)=5.4 kJ mol⁻¹, DH(K2)=5.0, DH(K3)=5 ?

C2H4O2 HL Acetic acid CAS 64-19-7 (36)

Ethanoic acid; CH₃.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaClO4	25°C	1.0M	C		K1=2.40	1981NJa (20141)	28
Pu+++	oth	none	?	0.00	U		K1=2.85 B2=5.06 B3=6.57 B4=7.68 B5=8.42 B6=8.74	1969MOc (20142)	29

Data from survey of literature data

Pu+++	gl	NaClO4	20°C	2.00M	U		K1=2.02 B2=3.34	1968MCa (20143)	30
Pu+++	ISE	NaClO4	25°C	0.10M	U		B5=16.70	1962SNa (20144)	31

Medium: HClO4

C2H4O3 HL Glycolic acid CAS 79-14-1 (33)

2-Hydroxyethanoic acid; HO.CH₂.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	R4N.X	?	1.00M	U		K1=2.70 B2=4.68	1971MOc (20618)	32

Medium: NH₄Cl

Pu+++	oth	none	?	0.00	U		K1=3.60 B2=6.20	1969MOc (20619)	33
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Data from survey of literature data

C2H5NO2 HL Glycine CAS 56-40-6 (85)

2-Aminoethanoic acid; H₂N.CH₂.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	KCl	18°C	1.00M	U	T	K(Pu+HL=PuL+H)=-3.21	1973RKa (21698)	34

C3H6O2 HL Propionic acid CAS 79-09-4 (35)

Propanoic acid; CH₃.CH₂.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaClO4	25°C	1.0M	C		K1=2.78 B2= 5.40	1981NJa (25046)	35

C3H7NO2 HL Alanine CAS 56-41-7 (86)
 2-Aminopropanoic acid; H2N.CH(CH3).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	KCl	19°C	1.00M	U		K1=3.40	1973RKa (26254)	36

C3H7NO3 HL Serine CAS 56-45-1 (49)
 2-Amino-3-hydroxypropanoic acid; H2N.CH(CH2.OH)COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	KCl	19°C	1.00M	U		K1=3.42	1973RKa (27172)	37

C4H7NO4 H2L Aspartic acid CAS 56-84-8 (21)
 Aminobutanedioic acid; H2N.CH(CH2.COOH).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	KCl	18°C	1.00M	U		K1=4.84	1973RKa (31935)	38

C4H8O2 HL Isobutyric acid CAS 79-31-2 (573)
 2-Methylpropanoic acid; CH3.CH(CH3).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	oth	none	?	0.00	M		K1=3.60 B2=6.16 B3=7.43	1969MOc (33244)	39

Data from survey of literature data

 C4H8O3 HL CAS 594-61-6 (81)
 2-Hydroxy-2-methylpropanoic acid; (CH3)2C(OH).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	R4N.X	?	0.50M	U		K1=2.60 B2=4.57 B3=5.52	1971MOc (33512)	40

Medium: NH4Cl

 C5H8O7 H2L CAS 40120-71-6 (3022)
 2,3,4-Trihydroxypentanedioic acid, Trihydroxyglutaric acid; HOO.C.(CH(OH))3.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	ix	R4N.X	?	1.00M	U		K1=2.74 K(Pu+HL)=2.11	1971MOc (38436)	41

K(Pu+2HL)=3.87

Medium: NH4Cl

Pu+++ oth none ? 0.0 M K1=4.50 1969M0c (38437) 42
K(Pu+HL)=3.04
K(Pu+2HL)=5.40

Constants from survey of literature data

C6H9NO6 H3L NTA CAS 139-13-9 (191)
Nitrilotriethanoic acid; N(CH2.COOH)3

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	KCl	25°C	1.00M	U		K1=10.26	1978MGa (47001)	43
Pu+++	ix	R4N.X	20°C	1.00M	U		K1=10.60 K(Pu+L+HL)=13.53	1971M0c (47002)	44

Medium: NH4Cl

Pu+++ oth none ? 0.00 M K1=13.13 1969M0c (47003) 45
Constant obtained from survey of literature data

C7H6O2 HL Tropolone CAS 533-75-5 (3129)
2-Hydroxycyclohepta-2,4,6-trien-1-one;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaCl04	20°C	1.00M	U		K1=7.20	1973MBb (53687)	46

C7H6O6S H3L CAS 5965-83-3 (399)
5-Sulfosalicylic acid, 2-Hydroxy-5-sulfobenzoic; H03S.C6H3(OH).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	gl	NaCl04	25°C	1.0M	C		K1=8.57 B2=17.51	1983Nca (55040)	47
Pu+++	gl	NaCl04	25°C	1.0M	U		K1=8.57 B2=17.51	1979Nca (55041)	48

C8H5O2F3S HL TTA CAS 326-91-0 (165)
4,4,4-Trifluoro-1-(2-thienyl)butane-1,3-dione; F3C.CO.CH2.CO.C4H3S

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu+++	dis	NaCl04	23°C	0.2M	U		K1=-3.8 lg K(e)=-2.5	1975HHa (58671)	49

C10H16N2O8 H4L EDTA CAS 60-00-4 (120)
1,2-Diaminoethane-N,N,N',N'-tetraethanoic acid, Sequestric acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
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Pu++++ sp oth/un 400°C 100% U T H 1974LDc (843) 60
K=-0.38

Medium:(Li,K)Cl eutectic; K: Pu + Cl-=Pu+++ + 1/2Cl2(g); DH=36.0 kJ mol-1.
K=-0.17(450 C), 0.00(500 C), 0.13(550 C)

Pu++++ sp NaClO4 25°C 2.00M U T H 1973Kmd (844) 61
K=-0.03

K: Pu + 1/2HNO2 + 1/2H2O=Pu+++ + 3/2H+ + 1/2NO3-; DH=38 kJ mol-1.
K=-0.13(19 C), -0.11(21 C), 0.16(32 C), 0.23(36 C)

Pu++++ oth oth/un 615°C 100% U T 1971BRb (845) 62
K=-0.93

Medium:(Li,Be,Th)F; K: PuO2(ss)+3/4ThF4(d)+1/2Ni(c)=PuF3(d)+3/4ThO2(ss)+
1/2NiO(c).K=0.05(715 C)(x units,c=pure crystalline phase, ss=solid solution)

Pu++++ EMF KNO3 25°C 0.20M U I 1958AGa (846) 63
K(Pu+e=Pu(III))=15.92(942mV)

Medium:HNO3. In 1 M: K=15.45(914 mV), 0.4 M: K=15.72(930 mV)

Pu++++ EMF KNO3 25°C 0.25M U I 1958SPa (847) 64
K(Pu+e=Pu(III))=16.16(956mV)

Medium: HNO3. In 1 M HNO3: K=15.81(935 mV), 5 M: K=15.50(917 mV). In 1 M HCl
K=16.18(957 mV), 1 M HClO4: K=16.43(972 mV), 0.5 M H2SO4: K=12.49(739 mV)

Pu++++ EMF NaClO4 25°C 2.0M U H 1957RAa (848) 65
Medium: HClO4. DH(Pu+e=Pu(III))=-55.6 kJ mol-1

Pu++++ oth none 25°C 0.0 U 1952LAb (849) 66
K(Pu+e=Pu(III))=16.35(970 mV)

From thermodynamic data

Pu++++ EMF KCl 25°C 1.0M U I 1951RLa (850) 67
K(Pu+e=Pu(III))=16.38(969mV)

Medium: HCl. In HClO4: K=16.60(982 mV). DH=-56.6 kJ mol-1(10-35 C)

Br- HL Bromide CAS 10035-10-6 (19)
Bromide;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis oth/un 25°C 1.00M U K1=0.33 1975RRa (2281) 68

Pu++++ dis oth/un 25°C 4.0M U K1=1.00 B2=0.64 1966D0a (2282) 69

Medium: HCl

C03-- H2L Carbonate CAS 465-79-6 (268)
Carbonate;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ EMF none 25°C 0.0 U T H K1=41 1980LTb (3353) 70
 60 C: K1<37; 100 C: K1<35; 200 C: K1<31. Evaluated data

Pu++++ sol KCl 20°C 10.0M U K1=46.96 1958GMa (3354) 71
 Ks(Pu(OH)4(s)+CO3)=-13.35

Also by spectrophotometry. Ks: Pu(OH)4(s)+CO3=PuCO3+4OH

Cl- HL Chloride CAS 7647-01-0 (50)
 Chloride;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ EMF none 25°C 0.0 U T H K1=0.9 1980LTb (5584) 72
 60 C: K1=1; 100 C: K1=2; 200 C: K1=4. Evaluated data

Pu++++ dis NaClO4 23°C 2.00M U K1=0.15 B2=-0.64 1976BRc (5585) 73

Pu++++ dis NaClO4 25°C 4.0M U K1=0.30 B2=-0.80 1966DOa (5586) 74
 Medium: HClO4

Pu++++ ix NaClO4 20°C 4.0M U K1=0.15 B2=0.08 1960GNa (5587) 75
 B3<-0.7

Pu++++ EMF oth/un 25°C 1.0M U K1=-0.1 B2=-0.5 1960KPb (5588) 76

Pu++++ EMF NaClO4 25°C 1.0M U K1=0.14 B2=-0.17 1958SLc (5589) 77

Pu++++ EMF oth/un 25°C 1.0M U K1=0.32 1957KSa (5590) 78

Pu++++ EMF NaClO4 25°C 2.0M U I K1=-0.23 1955RCa (5591) 79
 Medium: HClO4. In 1M HClO4 K1=-0.25

Pu++++ EMF NaClO4 25°C 1.0M U K1=-0.24 1951RLa (5592) 80

Pu++++ sp KNO3 25°C 2.0M U K1=-0.42 1949HIa (5593) 81

F- HL Fluoride CAS 7644-39-3 (201)
 Fluoride;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ ISE NaClO4 23°C 1.0M C K1=7.61 B2=14.77 1990SCa (7122) 82
 B3=20.11
 B4=26.07

Medium: 1.0 M HClO4/NaClO4. Method: F ion selective electrode.

Pu++++ dis oth/un 25°C 2.0M U T H K1=3.84 1983NCb (7123) 83
 K[Pu+H+2L]=6.28

in 2 M HClO4

Pu++++	EMF none	25°C	0.0	U T H	K1=8	1980LTb (7124)	84
100 C: K1=9; 200 C: K1=10. Evaluated data							
Pu++++	dis NaClO4	25°C	2.00M	U	K1=4.64 B2=7.62	1976BRb (7125)	85
Pu++++	dis oth/un	23°C	2.00M	U	K1=4.64 B2=7.61	1976BRc (7126)	86
Pu++++	ix NaClO4	?	1.0M	U I		1969KKb (7127)	87
						K(Pu+HF=PuF+H)=4.20	
Medium: HClO4. K=4.45(I=2)							
Pu++++	ix KNO3	?	1.0M	U I		1969KKc (7128)	88
						K(Pu+HF=PuF+H)=4.04	
Medium: HNO3. K=3.78(I=2)							
Pu++++	sol KNO3	25°C	var	U		1961MFa (7129)	89
						Kso(PuF4)=-19.2	
Pu++++	con none	25°C	0.0	U	K1=7.94	1955PAa (7130)	90
Pu++++	sp KNO3	25°C	1.0M	U	K1=6.77	1949Mca (7131)	91

NH2SO3-		H2L	Sulfamate	CAS 5329-14-6	(452)		
Sulfamate;							

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values Reference ExptNo
Pu++++	sp	NaClO4	23°C	2.10M	U	K1=0.11	1968CLc (8801) 92

NO3-		HL	Nitrate	CAS 7697-37-2	(288)		
Nitrate;							

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values Reference ExptNo
Pu++++	sp	oth/un	20°C	2.0M	C I	K1=0.48 B2= 1.08	1998BVa (9882) 93
Medium: 2.0-19 m HClO4/HNO3. By extrapolation to I=0 using SIT theory, K1=2.12, B2=3.66. Method: near-infrared absorption spectrophotometry.							
Pu++++	dis	NaNO3	23°C	2.00M	U	K1=0.65 B2=1.12	1976BRc (9883) 94
Pu++++	sol	KNO3	25°C	var	U		1973BCa (9884) 95
						K(PuOnL0.4(s)=PuOn+0.4L)=2.3. K(PuOn+2.8L)=-1.6	
Pu++++	sp	KNO3	?	var	U		1973RAa (9885) 96
						K(Pu(H2O)8+6L=PuL6+8H2O)=6.60	
Pu++++	dis	oth/un	25°C	1.0M	U	K1=0.38 B2=0.43	1971MOf (9886) 97
Pu++++	dis	NaClO4	20°C	8.0M	U	K1=0.69 B2=0.42	1970LKa (9887) 98
						B4=-0.7	

Medium: HClO4

Pu++++ sol oth/un 1.0M U K1=0.38 B2=0.43 1969M0c (9888) 99

Pu++++ dis NaClO4 25°C 6.0M U I K1=1.00 B2=1.36 1966D0a (9889) 100
B3=0?

Medium: HClO4. At I=4: K1=0.97, B2=1.43, B3=-0.4?

Pu++++ sp none 25°C 0.0 U K1=1.80 1966SNe (9890) 101

Pu++++ dis NaClO4 25°C 4.70M U I K1=0.7 B2=1.1 1964LPa (9891) 102
B3=1.1
B4=0.6

In 1.9 M NaClO4, 0.6 M H+. K1=0.61, B2=0.85, B3=0.64, B4=0.11.

In 1.02 M HClO4: K1=0.72, B2=0.97, B3=0.63

Pu++++ ix NaClO4 20°C 4.0M U K1=0.74 B2=2.11 1960GNa (9892) 103
B3=1.2

Pu++++ dis oth/un 20°C 0.0 U T HM 1960MRa (9893) 104
Kd(Pu+4L+2TTBP(kerosene)=PuL4(TBP)2(kerosene))=3.42(20 C), 3.26(30 C),
2.98(50 C), 2.72(70 C); DH(Kd)=-25 kJ mol⁻¹

Pu++++ EMF NaClO4 25°C 1.0M U K1=0.54 1951RLa (9894) 105

Pu++++ sp NaClO4 25°C 2.0M U K1=0.46 1949HIa (9895) 106

Pu++++ dis oth/un 25°C 6.0M U T H K1=0.46 B2=0.44 1949ZNa (9896) 107
K3=-0.48

DH(K1)=22.2 kJ mol⁻¹, DS=88 J K⁻¹ mol⁻¹. K1=0.92(45 C) estimated?

OH- HL Hydroxide (57)
Hydroxide;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ gl none 25°C 0.0 U T H 1980LTb (12010) 108

*K1=-1
*B2=-2
*B3=-5
*B4=-9, *B5=-15

100 C: *K1=1, *B2=0, *B3=-4, *B4=-8, *B5=-13. 200 C: 2, 2, 0, -4, -9

Evaluated data

Pu++++ dis non-aq 22°C 100% M 1980SZa (12011) 109
B4(Pu(OH)4)=56.54

Pu++++ dis NaClO4 ? 1.00M U 1972MGe (12012) 110

*K1=-0.45
*K2=-0.75

*K4=-6.3

Pu++++ sp NaClO4 25°C 2.0M U T H 1960RKb (12014) 112
 *K1=-1.73
 DH(*K1)=35.6 kJ mol⁻¹; *K1=-1.9(15.4 C). In D2O *K1=-2.4(15.4 C), -1.94(25C)

Pu++++ EMF NaClO4 25°C 2.0M U T H 1958RAa (12016) 114
*K1=-1.27
Medium:LiClO4; DH(*K1)=30.5 kJ mol⁻¹, DS=79; *K1=-1.41(15 C), -1.06(34.3 C)

Pu++++ EMF NaClO4 25°C 2.0M U T H 1957RAa (12017) 115
*K1=-1.26
Medium:Na,LiClO4; DH(*K1)=30.5 kJ mol-1,DS=79; *K1=-1.41(15 C),-1.06(34.4 C)

Pu++++ oth NaClO4 25°C 2.0M U T 1957Rab (12018) 116
*K1=-1.27
*K1=-1.77(0 C), -1.51(12.5 C)

Pu++++ EMF NaClO4 25°C 1.0M U 1951RLa (12019) 117
*K1=-1.51

Pu++++ sp NaClO4 25°C 0.50M U 1950KNa (12020) 118
*K1=-1.60

Pu++++ sp NaCl 25°C 1.11M U 1949HIa (12021) 119
*K1=-1.6

Pu++++ sp NaCl04 25°C 0.50M U 1949KNa (12022) 120
*K1=-1.55

O2--	H2L	Peroxide	CAS 7772-84-1	(2813)
Peroxide; -0.0-				

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
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Pu++++ sp oth/un 25°C 0.50M U 1949Cma (12696) 121
 $K(2\text{Pu}+\text{H}_2\text{L}+\text{H}_2\text{O}=\text{Pu}_2\text{LOH}+3\text{H})=6.94$
 $K(2\text{Pu}+2\text{H}_2\text{L}=\text{Pu}_2\text{L}_2+4\text{H})=8.80$

Medium: HCl. Pu2LOH is brown. Pu2L2 is red

P04--- H3L Phosphate CAS 7664-38-2 (176)
Phosphate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu++++	EMF	none	25°C	0.0	U T H			1980LTb (13311)	122
							K(Pu+HPO4)=13 K(Pu+2HPO4)=24 K(Pu+3HPO4)=33 K(Pu+4HPO4)=43		
100 C: values are:15, 25, 35, 43; 200 C: 17, 29, 39, 46									
Evaluated data									

Pu++++	sol	NaClO4	25°C	2.00M	U I			1960DMa (13312)	123
							Ks(Pu(HL)2(s)=Pu(HL)2)=-4.18 Ks(Pu(HL)2(s)=Pu+2HL)=-27.75 Ks(Pu(HL)2(s)+4H=Pu+2H3L)=-9.9		
In 2 M LiNO3 Ks(Pu(HL)2(s)=Pu+2HL)=-27.68									

Pu++++	sol	oth/un	25°C	2.00M	U			1960DMa (13313)	124
							K(Pu+HL)=12.92 K(PuHL+HL)=10.82 K(Pu(HL)2+HL)=9.68 K(Pu(HL)3+HL)=9.80		
Medium:HNO3, K(Pu(HL)4+HL)=8.80. B(Pu(HL)5)=52.05. Also many solubility data									

Pu++++	sol	NaNO3	25°C	2.08M	U			1949KIb (13314)	125
							K(Pu+H3L)=2.3 Ks(Pu(HL)2(H2O)x(s)+4H=Pu+2H3L)=-7.5; Ks(Pu(HL)2(H2O)x(s)+4H=PuH3L+H3L)=-5.2		

S04-- H2L Sulfate CAS 7664-93-9 (15)									
Sulfate;									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu++++	dis	oth/un	25°C	2.0M	U T H		K1=3.84 K[Pu+H+2L]=6.28	1983NCb (16493)	126
in 2 M HClO4									

Pu++++	EMF	none	25°C	0.0	U T H		K1=6 B2=10	1980LTb (16494)	127
100 C: K1=7, B2=12; 250 C: K1=8, B2=15. Evaluated data									

Pu++++	dis	NaClO4	25°C	2.00M	U			1976BRb (16495)	128
							K(Pu+HL=PuL+H)=2.82 K(Pu+2HL=PuL2+2H)=4.67		

Pu++++	dis	NaClO4	25°C	2.00M	U		K1=2.84 B2=4.7	1976BRc (16496)	129
B(Pu+HSO4+NO3)=3.0									

Pu++++	ix	oth/un	25°C	2.0M	U			1974FPa (16497)	130
							K(Pu+HSO4)=2.74 K(Pu+2HSO4)=4.43		

Background medium is 2.0M HClO4.

Methanoic acid; H.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Pu++++	sp	NaClO4	25°C	1.00M	U		K1=3.64 B2=6.65	1984AKa (17644)	142

CH4N2O L Urea CAS 57-13-6 (2018)
 Carbamide, Urea; (H2N)2CO

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
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Pu++++	dis	NaClO4	?	1.00M	U	I M		1971SSj (17724)	143
--------	-----	--------	---	-------	---	-----	--	-----------------	-----

K(Pu+2NO3+L)=0.48
 K(Pu+3NO3+L)=1.90
 K(Pu+3NO3+2L)=2.67
 K(Pu+4NO3+L)=2.18

K(Pu+4NO3+2L)=3.40

C2H2O4 H2L Oxalic acid CAS 144-62-7 (24)
 Ethanedioic acid; (COOH)2

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
-------	-----	--------	------	------	-----	-------	-------------	-----------	--------

Pu++++	dis	NaClO4	25°C	4.0M	U		K1=8.30 B2=14.90	1983CBa (19041)	144
--------	-----	--------	------	------	---	--	------------------	-----------------	-----

Medium: 4 M HClO4/NaClO4

Pu++++	dis	NaClO4	25°C	1.00M	U		K1=9.74 B2=17.37	1976BRa (19042)	145
--------	-----	--------	------	-------	---	--	------------------	-----------------	-----

Pu++++	sol	oth/un	20°C	0.75M	U			1958MGa (19043)	146
--------	-----	--------	------	-------	---	--	--	-----------------	-----

Kso=-21.3

Pu++++	sp	KNO3	20°C	1.0M	U		K1=8.74 B2=16.91	1958MGb (19044)	147
--------	----	------	------	------	---	--	------------------	-----------------	-----

K3=6.48
 B4=27.50

Medium: HNO3

C2H4O2 HL Acetic acid CAS 64-19-7 (36)
 Ethanoic acid; CH3.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
-------	-----	--------	------	------	-----	-------	-------------	-----------	--------

Pu++++	sp	KNO3	20°C	1.0M	U		K1=5.85 B2=9.73	1980PDa (20145)	148
--------	----	------	------	------	---	--	-----------------	-----------------	-----

B3=12.72
 B4=13.85

Pu++++	ix	KNO3	20°C	1.00M	U		B2=8.98	1980PDb (20146)	149
--------	----	------	------	-------	---	--	---------	-----------------	-----

Pu++++	oth	oth/un	?	0.50M	U		K1=2.88 B2=4.90	1969MOc (20147)	150
--------	-----	--------	---	-------	---	--	-----------------	-----------------	-----

B3=7.60
 B4=9.90
 B5=12.5
 B6=14.8

Data from survey of literature data
 B7=17.2, B8=20.3. Metal ion is PuO⁺⁺

```
-----
Pu++++    sp  oth/un 25°C 0.50M U      K1=4.9    B2=9.8    1963NSa (20148) 151
                                         B3=14.6
                                         B4=19.4
                                         B5=22.9
-----
```

```
-----
Pu++++    ISE NaCl04 25°C 0.10M U      K1=5.3    B2=9.0    1962SNa (20149) 152
                                         B3=13.9
                                         B4=18.3
                                         B5=22.60
-----
```

Medium: HCl04

```
*****
C3H6O3          HL    L-Lactic acid    CAS 79-33-4  (82)
L-2-Hydroxypropanoic acid; CH3.CH(OH).COOH
-----
```

```
-----
Metal      Mtd Medium Temp Conc Cal Flags Lg K values      Reference ExptNo
-----
Pu++++    sp  NaCl04 25°C 0.50M U      B4=16.2    1966NEa (25529) 153
-----
```

```
*****
C4H6O6          H2L    L-Tartaric acid  CAS 87-69-4  (92)
L-Tartaric acid, L-2,3-Dihydroxybutanedioic acid; HOOCH(OH).CH(OH).COOH
-----
```

```
-----
Metal      Mtd Medium Temp Conc Cal Flags Lg K values      Reference ExptNo
-----
Pu++++    dis oth/un  ?  0.80M U      K1=8.48    1968ORa (31342) 154
Medium: 0.8-2.0 M HNO3
-----
```

```
*****
C5H8O2          HL    Acetylacetone    CAS 123-54-6  (164)
Pentane-2,4-dione; CH3.CO.CH2.CO.CH3
-----
```

```
-----
Metal      Mtd Medium Temp Conc Cal Flags Lg K values      Reference ExptNo
-----
Pu++++    dis NaCl04 25°C 0.10M U      B3=17.77   K4=5.91    1960RYa (38069) 155
-----
```

```
-----
Pu++++    dis NaCl04 25°C 0.10M U      K1=10.5    B2=19.7    1955RYb (38070) 156
                                         K3=8.4
                                         K4=6.0
-----
```

```
*****
C6H8O7          H3L    Citric acid    CAS 77-92-9  (95)
2-Hydroxypropane-1,2,3-tricarboxylic acid; HOOCCCH2.CH(OH)(COOH).CH2COOH
-----
```

```
-----
Metal      Mtd Medium Temp Conc Cal Flags Lg K values      Reference ExptNo
-----
Pu++++    oth NaCl04  ?  1.00M U      K1=11.7    B2=15.7    1972MGe (46240) 157
-----
```


Pu++++ sp NaClO4 25°C 0.50M U K1=15.2 B2=30.1 1966NEb (46241) 158

By glass electrode: K1=15.7, B2=29.5

C7H7NO2 HL CAS 495-18-1 (184)

Benzohydroxamic acid; C6H5.CO.NH.OH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis KNO3 25°C 7.0M U K1=12.73 1966BBf (55514) 159

Medium: HNO3

C7H7NO6S H2L CAS 35379-88-5 (4464)

3-Nitro-p-cresol-5-sulfonic acid; (CH3)(HO).C6H2(NO2).SO3H

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis NaCl 25°C 1.0M U K1=8.29 1972BEa (55698) 160

C8H5O2F3S HL TTA CAS 326-91-0 (165)

4,4,4-Trifluoro-1-(2-thienyl)butane-1,3-dione; F3C.CO.CH2.CO.C4H3S

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis NaClO4 25°C 2.00M U K1=1.92 1976BRb (58672) 161

Pu++++ sp oth/un 25°C 0.20M U I K1=8.96 1964PCa (58673) 162

At I=0 K1=8.0

C10H16N2O8 H4L EDTA CAS 60-00-4 (120)

1,2-Diaminoethane-N,N,N',N'-tetraethanoic acid, Sequestic acid;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ sp NaClO4 20°C 0.10M U K1=25.6 1973CGe (74113) 163

K(PuL+H)=2.6

K1 by potentiometry

Pu++++ sol KNO3 21°C 0.10M U K1=26.0 1969MIb (74114) 164

Medium: 0.1 H2SO4, 1.0 HNO3. 15-21 C

Pu++++ sol oth/un 25°C ? U K1=26.1 1959KSa (74115) 165

Pu++++ ix KCl 20°C 0.10M U T K1=17.66 1957FSa (74116) 166

C14H23N3O10 H5L DTPA CAS 67-43-6 (238)

Diethylenetriamine-pentaethanoic acid; HOOC.CH2.N(CH2.CH2.N(CH2.COOH)2)2

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ EMF NaCl 20°C 0.50M U K1=29.49 1972PRc (89371) 167

Pu++++ ix R4N.X ? 1.0M U K1=29.40 1971MOc (89372) 168
Medium: NH4Cl

Pu++++ oth oth/un ? 1.0M U K1=29.4 1969MOc (89373) 169
From survey of literature data

C14H26N2O7 H2L (1567)
1,4,10-Trioxa-7,13-diazacyclopentadecane-N,N'-diethanoic acid;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis oth/un 25°C 0.10M U 1990MMe (90204) 170
K(Pu+H4L=PuL+4H)=21.52

C16H13N2O11AsS2 H6L Arsenazo I CAS 520-10-5 (277)
2-(2'-Arsonophenylazo)chromotropic acid;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ sp oth/un 20°C ? U 1961KPc (93264) 171
K(Pu+H3L)=7.7
K(Pu(OH)+H4L)=6.6

C16H30N2O8 H2L CAS 72912-01-7 (1568)
1,4,10,13-Tetraoxa-7,16-diazacyclooctadecane-N,N'-diethanoic acid;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis oth/un 25°C 0.10M U 1990MMe (95053) 172
K(Pu+H4L=PuL+4H)=19.11

Method: solvent extraction

C17H14N2O2 L CAS 4551-69-3 (698)
4-Benzoyl-3-methyl-1-phenyl-2-pyrazolin-5-one;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ dis oth/un 15°C 1.0M U K1=10.87 B2=20.94 1966ZCa (95897) 173
B3=30.20
B4=38.68

C18H24N6O9 H3L BAMTPH CAS 87834-24-0 (5915)
N,N',N''-Tris(3-(hydroxyamino)-3-oxopropyl)-1,3,5-benzenetricarboxamide;
C6H3(CONHCH2CH2CONHOH)3

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

Pu++++ sp none 22°C 0.0 U K1=30.0 1991JHa (97623) 174

C25H48N6O8 H3L Desferrioxamine CAS 70-51-9 (2488)
 Desferrioxamine B; NH2.((CH2)5.NOH.CO.C2H4.CO.NH)2.(CH2)5.NOH.CO.CH3

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu++++	sp	none	22°C	0.0	U			K1=30.8	1991JHa (103820)	175

ligand name: N'-[5-[[4-[[5-(acetylhydroxamino)pentyl]amino]-1,4-dioxobutyl]-hydroxyamino]pentyl]-N-(5-aminopentyl)-N-hydroxy-butanediamide

 C34H55N7O12 H5L CAS 153502-63-7 (7187)
 N-(2,3-Dihydroxy-4-(methyldiamido)benzoyl)desferrioxamine B;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
Pu++++	sp	KCl	25°C	0.22M	C			K1=41.7 B(PuHL)=47.6	1996WNa (106165)	176

 e- HL Electron (442)
 Electron;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
PuO2+	sol	oth/un	25°C	.001M	U			K(e + PuO2+=PuO2)=14.8 K(e + 2H2O+PuO2+=Pu(OH)4)=12.8	1980RSa (851)	177

Where PuO2 is crystalline and Pu(OH)4 is amorphous. Medium: 0.0015M CaCl2.

 CO3-- H2L Carbonate CAS 465-79-6 (268)
 Carbonate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
PuO2+	oth	R4N.X	20°C	0.25M	U			K(PuO2+2HL)=1.90	1978MPa (3355)	178

Medium: NH4Cl. Method: Coprecipitation

PuO2+	sol	oth/un	20°C	0 ?	U			K1=12 B2=15.06 B(PuO2(OH)L)=23.85 B(PuO2(OH)2L)=23.0	1962GMb (3356)	179
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Ks((NH4)2PuO2L2(s)=2NH4+PuO2L2)=-1.33

PuO2+	sol	oth/un	24°C	var	U			K(PuO2L(s)+HL=PuO2HL2)=-0.89	1962WSa (3357)	180
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Medium: LiHCO3.

PuO2+	sol	none	25°C	0.0	U			B2=15	1961GMa (3358)	181
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 Cl- HL Chloride CAS 7647-01-0 (50)
 Chloride;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sp	none	?	0.0	U		K1=-0.17	1956RAb (5594)	182

N03-		HL		Nitrate			CAS 7697-37-2	(288)	
Nitrate;									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sp	oth/un	25°C	0.00	U		B2=4.65	1976VAa (9897)	183

OH-		HL		Hydroxide			(57)		
Hydroxide;									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sp	NaCl04	25°C	0.2M	C	IH	K1=7.95	2003YFb (12023)	184

PuO2+	gl	none	25°C	0.0	U	T H		1980LTb (12024)	185
							*K1=-10		
60 C: *K1=-8. 100 C: -7. 150 C: -7. 200 C: -6									
Evaluated data									

PuO2+	gl	NaCl04	25°C	3.00M	C			1975SCa (12025)	186
							*B(2,2)=-8.23		
							*B(7,4)=-29.13		

PuO2+	sol	KN03	?	var	U			1968ZAd (12026)	187
							Kso(PuO2(OH))=-9.3		

PuO2+	gl	none	25°C	0.0	U			1949KDa (12027)	188
							*K1 < -9.7		
							Kso(PuO2OH(s)) < -8.6		

P04---		H3L		Phosphate			CAS 7664-38-2	(176)	
Phosphate;									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	oth	R4N.X	20°C	0.10M	U			1978MPa (13315)	189
							K(PuO2+HL)=2.39		

Method: co-precipitation.

C2H2O4		H2L		Oxalic acid			CAS 144-62-7	(24)	
Ethanedioic acid; (COOH)2									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sol	oth/un	25°C	0.50M	U		K1=3.95 B2=6.43	1979MPb (19045)	190
Medium: ammonium oxalate									

PuO2+	sol	oth/un	20°C	1.00M	U	K1=3.95	B2=6.43	1979MPc (19046)	191
PuO2+	sp	oth/un	?	?	U	K1=3.70		1973ZAa (19047)	192
PuO2+	kin	oth/un	?	0.10M	U	K1=3.88	B2=6.70	1967EKa (19048)	193
K(PuO2+HL)=2.32									

C2H4O2		HL		Acetic acid		CAS 64-19-7		(36)	
Ethanoic acid; CH3.COOH									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sol	oth/un	25°C	1.00M	U		K1=1.58	1979MPb (20150)	194
Medium: ammonium oxalate									

C2H5NO2		HL		Glycine		CAS 56-40-6		(85)	
2-Aminoethanoic acid; H2N.CH2.COOH									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	ix	oth/un	25°C	0.10M	C		K1=3.04	1968EWa (21699)	195
Medium: 0.10 M NH4ClO4.									

C4H7NO4		H2L		IDA		CAS 142-73-4		(118)	
Iminodiethanoic acid; HN(CH2.COOH)2									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	gl	NaClO4	20°C	1.00M	U		K1=8.50	1973CBc (32348)	196
PuO2+	sp	R4N.X	25°C	0.10M	U		K1=6.18	1970EWa (32349)	197
Medium: NH4ClO4									

C6H9NO6		H3L		NTA		CAS 139-13-9		(191)	
Nitrilotriethanoic acid; N(CH2.COOH)3									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	ix	R4N.X	25°C	0.10M	U	T	K1=6.91	1970EWa (47004)	198
Medium: NH4ClO4									

C8H6O4		H2L		Phthalic acid		CAS 88-99-3		(113)	
Benzene-1,2-dicarboxylic acid; C6H4(COOH)2									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	ix	NaClO4	25°C	0.10M	U			1984RDa (59008)	199
K1eff=3.43 (pH 7)									

C10H16N2O8 H4L EDTA CAS 60-00-4 (120)
 1,2-Diaminoethane-N,N,N',N'-tetraethanoic acid, Sequestic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	sp	NaClO4	20°C	?	U			1975CGa (74117)	200
							K(PuO2+L)=12.9 or 11.7 K(PuO2+HL)=5.6		

PuO2+	ix	R4N.X	25°C	0.10M	U			1970EWa (74118)	201
							K(PuO2+HL)=4.80		

Medium: (NH4ClO4)

PuO2+	gl	KCl	20°C	0.10M	U		K1=12.9	1961KAa (74119)	202
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PuO2+	ix	oth/un	20°C	0.05M	U		K1=10.2	1959GAa (74120)	203
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C10H18N2O7 H3L HEDTA CAS 150-39-0 (392)
 N-(Hydroxyethyl)diaminoethane-N,N',N'-triethanoic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	ix	R4N.X	25°C	0.10M	U			1970EWa (75484)	204
							K(PuO2+HL)=4.46		

Medium: NH4ClO4

C16H35O4P HL CAS 298-07-7 (1625)
 Di-(2-ethylhexyl)-phosphoric acid; (C2H5C6H12O)2P(O)OH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2+	dis	oth/un	25°C	2.0M	U		K1=-0.10 B2=-0.70	1989BFe (95514)	205
							In 2.0 M HCl; for 15 C K1=-0.06; K2=-0.89; for 35 C K1= 0.04; K2=-1.16		

e- HL Electron (442)
 Electron;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	EMF	none	25°C	0.0	U T H			1980LTb (852)	206
							K'=-18 K''=-13 K'''=-42		

K': 4PuO2+2H2O=4Pu(V)O2+4H+O2. K'': 2PuO2+4H=2Pu(IV)+2H2O+O2. K''': 4PuO2+4H=4Pu(IV)+2H2O+3O2. At 200 C; K'=-4, K''=-13, K'''=-19. Evaluated data

PuO2++	sp	oth/un	400°C	100%	U T H			1974LDb (853)	207
							K=-1.05		

Medium:(Li,Cs)Cl; K: PuO2++ + Cl-=PuO2+ + 1/2Cl2(g); DH=29.7 kJ mol-1.

$K = -0.88(450\text{ C}), -0.76(500\text{ C}), -0.63(550\text{ C})$

PuO₂⁺⁺ EMF none 25°C 0.00 U 1970BCc (854) 208
 $K(\text{PuO}_2^{++} + e) = 17.12(1.013\text{V})$

PuO₂⁺⁺ EMF oth/un 25°C 0.97M U I 1970PKa (855) 209
 $K = 14.37(0.850\text{V}, C=0.97)$
Medium: C M NaOH. At C=0.97; K: Pu(VII) + e = Pu(VI). $K = 12.49(0.739\text{V}, C=3.1)$,
 $12.09(0.715\text{V}, C=4.6)$, $10.53(0.623\text{V}, C=7.3)$

PuO₂⁺⁺ EMF oth/un 25°C U I 1970PKa (856) 210
 $K = 9.15(0.541\text{V}, C=10.2)$
Medium: C M NaOH. At C=10.2; K: Pu(VII) + e = Pu(VI). $K = 8.16(0.483\text{V}, C=12.0)$,
 $6.68(0.395\text{V}, C=14.0)$

PuO₂⁺⁺ sp KNO₃ 25°C 0.10M U I 1959AMb (857) 211
 $K = -0.90$
Medium: HNO₃. K: Pu(VI) + 2Pu(III) = 3Pu(IV). In for 0.4 M HNO₃: $K = 2.25$,
0.3 M: $K = 1.30$, 0.2 M: $K = 0.34$

PuO₂⁺⁺ EMF KNO₃ 25°C 0.10M U 1958AGa (858) 212
 $K(\text{PuO}_2 + e) = 15.50(917\text{ mV})$

PuO₂⁺⁺ EMF KNO₃ 25°C 1.0M U I 1958AGa (859) 213
 $K(\text{Pu} + 2e = \text{Pu(IV)}) = 35.64(1054\text{ mV})$
Medium: HNO₃. In 0.4 M: $K = 33.57(993\text{ mV})$, 0.3 M: $K = 32.90(973\text{ mV})$, 0.2 M:
 $K = 32.09(949\text{ mV})$, 0.1 M: $K = 31.27(925\text{ mV})$

PuO₂⁺⁺ kin NaClO₄ 25°C 1.0M U TIH 1958RKa (860) 214
 $K = -1.14$
Medium: HClO₄. K: PuO₂ + Pu(III) = PuO₂(V) + Pu(IV). $\text{DH}(K) = -36.4\text{ kJ mol}^{-1}$, $\text{DS} = -146$
at 25 C. At 0 C: $K = -0.65$, 15 C: -0.97 , 34.5 C: $K = -1.37$. Also in DClO₄

PuO₂⁺⁺ kin NaClO₄ 25°C 1.0M U TIH 1958RKa (861) 215
 $K = -1.58$
Medium: D₂O, 1 M DClO₄. $K(\text{PuO}_2 + \text{Pu(III)} = \text{PuO}_2(\text{V}) + \text{Pu(IV)})$. $\text{DH}(K) = -30.1\text{ kJ mol}^{-1}$
 $\text{DS} = -130\text{ J K}^{-1}\text{ mol}^{-1}(25\text{ C})$. At 4.8 C: $K = -1.18$, 16.2 C: $K = -1.40$

PuO₂⁺⁺ EMF NaClO₄ 25°C 1.0M U T H 1956RAb (862) 216
 $K(\text{PuO}_2 + e) = 15.49(25\text{ C}; 916.4\text{ mV})$
Medium: HClO₄. $\text{DH}(K) = -95.8\text{ kJ mol}^{-1}$, $\text{DS} = -25\text{ J K}^{-1}\text{ mol}^{-1}$. At 6.6 C: $K = 16.55$
(918.9 mV), 16 C: $K = 16.01(918.4\text{ mV})$

PuO₂⁺⁺ kin KCl 25°C 0.95M U I 1953CMb (863) 217
 $K = 2.68$
Medium: HCl. K: PuO₂ + 2Pu(III) + 4H = 3Pu(IV) + 2H₂O. In 1 M HClO₄: $K = 2.05$

PuO₂⁺⁺ oth none 25°C 0.0 U 1952LAb (864) 218
 $K(\text{PuO}_2 + e = \text{PuO}_2(\text{V})) = 15.7(930\text{ mV})$
 $K = 35.2(1040\text{ mV})$

K: PuO2+4H+2e=Pu(IV)+2H2O. From thermodynamic data

C03-- H2L Carbonate CAS 465-79-6 (268)

Carbonate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	cal	oth/un	25°C		U			1988USa	(3359) 219
							DH(PuO2+3L)=-38.6 kJ mol-1		
Ionic strength is variable within 0.27-1.08									

PuO2++	sp	NaClO4	20°C	3.0M	C			1987RVa	(3360) 220
							B3=18.2		
							K(3PuO2+6CO3)=47.3		

Method: solubility of PuO2(CO3) in carbonate media.

PuO2++	EMF	NaClO4	22°C	3.0M	C			1986GRa	(3361) 221
							K(3PuO2L3=(PuO2)3+3L)=-7.4		
K(2UO2L3 + PuO2L3=(UO2)2(PuO2)L6+3L)=-8.8									

PuO2++	sp	NaClO4	25°C	3.0M	C	M		1986GRb	(3362) 222
							K(3(PuO2)(CO3)3=(PuO2)3(CO3)6+3(CO3))=-7.4		
							K(2(UO2)(CO3)3+(PuO2)(CO3)3=(PuO2)(UO2)2(CO3)6+3(CO3))=-8.8		

PuO2++	sp	NaClO4	25°C	0.1M	U		B2=13.1	1982SWa	(3363) 223
							K[PuO2(OH)2+HL]=2.67		

PuO2++	EMF	none	25°C	0.0	U T H		B2=15	1980LTb	(3364) 224
60 C: B2=16; 100 C: B2=16; 200 C: B2=17. Evaluated data									

PuO2++	EMF	oth/un	?	1.00M	U			1969MOc	(3365) 225
							K(PuO2+L+HL)=12.0		

Cl- HL Chloride CAS 7647-01-0 (50)

Chloride;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	sp	NaClO4	23°C	1.0M	C	I	K1=-0.48	1999RRa	(5595) 226
Medium: 0.1 M HClO4, 1.0 M NaClO4. In 0.1M HClO4, 4.6 M NaClO4, K1=-0.04.									
B2=-2.2 (0.1 M HClO4/1.9 M NaClO4), -1.9 (0.1 M/3.1 M), -1.3 (0.1 /4.6 M).									
PuO2++	EMF	none	25°C	0.0	U T H		K1=-0.3	1980LTb	(5596) 227
60 C: K1=0; 100 C: K1=1; 200 C: K1=3. Evaluated data									
PuO2++	dis	NaClO4	?	4.10M	U		K1=0.02 B2=-0.8?	1965MSc	(5597) 228
PuO2++	sp	NaClO4	20°C	2.0M	U T H		K1=-0.25	1961RMc	(5598) 229
Medium: HClO4. K1=-0.41(2.4 C), -0.34(10.2 C), -0.30(15 C), -0.17(29.6 C).									
DH(K1)=14 kJ mol-1 Alternatives for K1+K2 also given									

PuO2++ sp NaClO4 25°C 2.0M U K1=0.10 B2=-0.35 1957NBb (5599) 230

F- HL Fluoride CAS 7644-39-3 (201)
 Fluoride;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
 PuO2++ ISE NaClO4 21°C 1.0M C I K1=3.84 B2= 6.31 1985SCe (7132) 231
 B3=7.73
 At I=0.10 M NaClO4, K1=4.11, B2=6.92, B3=9.01.

PuO2++ EMF none 25°C 0.0 U T H K1=5.6 B2=11.0 1980LTb (7133) 232
 B3=15.9
 B4=18.8
 100 C: K1=6, B2=11, B3=15, B4=18; 200 C: K1=6, B2=11, B3=14, B4=18.
 Evaluated data

PuO2++ dis NaClO4 25°C 2.00M U K1=1.08 1976PRa (7134) 233

PuO2++ ix NaClO4 25°C 2.0M U I 1968KKd (7135) 234
 K(PuO2+HF=PuO2F+H)=2.00
 K(PuO2+2HF=PuO2F2+2H)=3.82
 K(PuO2+3HF=PuO2F3+3H)=5.52
 K(PuO2+4HF=PuO2F4+4H)=6.68

Method:cation exchange. Medium:HClO4. At I=1: values are 2.11, 4.15, 6.08, 6.30

NO3- HL Nitrate CAS 7697-37-2 (288)
 Nitrate;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
 PuO2++ dis NaClO4 20°C 8.0M U K1=-0.6 B2=-0.6 1970LKa (9898) 235
 Medium:HClO4

PuO2++ dis NaClO4 ? 4.10M U K1=-0.03 B2=-0.7? 1965MSc (9899) 236

PuO2++ gl oth/un ? var U K1=1.86? B2=3.42 1959KNa (9900) 237
 K(PuO2OH+L)=1.65 ?

Medium: PuO2L2

PuO2++ dis oth/un 25°C 0.0 U M 1959RMa (9901) 238
 Kd(PuO2+2L+2TBP(org)=PuO2L2(TBP)2(org))=0.8, org=alkane mixture,bp 140-240 C

PuO2++ sp non-aq 25°C 100% U 1958HGa (9902) 239
 K(PuO2L2+HL=HPuO2L3)=0.6

Also by distribution. Medium: Bu2CHOH

OH- HL Hydroxide (57)

Hydroxide;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	sp	NaClO4	RT	1.4M	U			1984MBb (12028)	240
K(2PuO2+2H2O=(PuO2)2(OH)2+2H)=-8.01 K(4PuO2+7H2O=(PuO2)4(OH)7+7H)=-29.32 by Raman spec.									
PuO2++	con	none	23°C	0.0	C			1983SGe (12029)	241
							*K1=-6.3		
PuO2++	gl	none	25°C	0.0	U	T H		1980LTb (12030)	242
							*K1=-5.6 *B2=-8.3 *B5=-21.6		
60 C: *K1=-4.8, *B2=-7.3, *B5=-19.2. 100 C: -4, -7, -17. 150 C: -3, -6, -16 Evaluated data									
PuO2++	sp	oth/un	?		U			1973MPe (12031)	243
							*K1=-3.85 *K2=-7.4 *B(2,3)=-10.6 Kso=-24.0		
*Kn(PuO2(OH)(n-1)+H2O=PuO2(OH)n+H); *B(3,2)(2PuO2+3H2O=(PuO2)2(OH)3+3H); Kso(PuO2(OH)2(s)=PuO2 + 2OH)									
PuO2++	gl	NaClO4	25°C	1.00M	U			1972CMf (12032)	244
							*K(PuO2+H2O=PuO2OH+H)=-5.97 *B(2,2)=-8.51 *B(3,5)=-22.16		
*B(m,n)(mPuO2 + nH2O=(PuO2)m(OH)n + nH)									
PuO2++	gl	NaClO4	25°C	3.00M	U			1971SCa (12033)	245
							*B(2,2)=-8.21		
*B(2,2)(mPuO2 + nH2O=(PuO2)m(OH)n + nH)									
PuO2++	gl	oth/un	20°C	var	U			1962Mza (12034)	246
							*Kso(PuO2(OH)2)=5.27 Kso(PuO2(OH)2)=-22.74 *K1=-3.39 *K2=-5.25		
*K3(PuO2(OH)2+H2O=PuO2(OH)3+H)=-9.52, *B(2,3)=-6.28, *B(2,5)=-22.10									
PuO2++	sol	none	?	0.0	U			1961GMb (12035)	247
							Kso=-24.5 or -22.7		
PuO2++	gl	oth/un	?	var	U			1959KNa (12036)	248
							*K1=-3.33(?) *K2=-4.05(?)		

PuO2++ gl NaClO4 25°C 1.0M U 1949KDa (12037) 249
 *K1=-5.71
 *K2=-5.71

 PuO2++ gl oth/un 25°C ? U 1948KNa (12038) 250
 Kso(PuO2(OH)2)=-20.5?

 PuO2++ oth oth/un ? ? U 19440Ca (12039) 251
 *K1=-5.30

 P04--- H3L Phosphate CAS 7664-38-2 (176)
 Phosphate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
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PuO2++	EMF	none	25°C	0.0	U T H			1980LTb (13316)	252
							K(PuO2+HP04+H)=11		

100 C: K=11; 200 C: K=12. Evaluated data

 PuO2++ oth none ? 0.0 U 1969M0c (13317) 253
 K(PuO2+H2L)=2.30
 K(PuO2+HL)=8.19

Methods: solubility, ion exchange, distribution, EMF
 I=0.5, by distribution: K(PuO2+H2L)=1.66

 PuO2++ sol oth/un 25°C var U 1967DSc (13318) 254
 K(PuO2+H2L)=3.93
 Ks(PuO2HL(H2O))=-4.34

Also electrical migration or transference number. Medium: H3L

 PuO2++ sol oth/un ? var U 1965DSc (13319) 255
 Kso(NH4PuO2L(H2O)3)=-26.6
 Ks(PuO2HL)=-12.55 ?
 B(NH4+PuO2+L)=21.43 ?
 K(PuO2+HL)=8.17 ?

 S04-- H2L Sulfate CAS 7664-93-9 (15)
 Sulfate;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
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PuO2++	EMF	none	25°C	0.0	U T H	K1=3		1980LTb (16509)	256
							60 C: K1=4; 100 C: 5; 150 C: 6; 200 C: 7. Evaluated data		

 PuO2++ dis NaClO4 25°C 2.00M U K1=1.16 1976PRa (16510) 257

 C2H2O4 H2L Oxalic acid CAS 144-62-7 (24)
 Ethanedioic acid; (COOH)2

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
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PuO2++ sol oth/un 20°C ? U K1=6.66 B2=11.4 1958GDa (19049) 258
Kso=-9.85

C2H3O2Cl HL Chloroacetic CAS 79-11-8 (34)
Chloroethanoic acid; ClCH2.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

PuO2++ EMF NaClO4 20°C 1.00M U K1=1.16 B2=1.61 1969CPb (19380) 259
B3=2.00

C2H4O2 HL Acetic acid CAS 64-19-7 (36)
Ethanoic acid; CH3.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

PuO2++ oth none ? 0.00 U K1=3.02 B2=5.47 1969MOc (20151) 260
B3=7.28
B4=8.06

Data from survey of literature data

PuO2++ sp oth/un 25°C 0.10M U I K1=2.31 B2=3.80 1968ESb (20152) 261
K1(I=1.0)=2.13, B2(I=1.0)=3.49, B3(I=1.0)=5.01

PuO2++ gl NaClO4 20°C 1.00M U K1=2.05 B2=3.54 1968MPa (20153) 262
B3=4.96

C2H4O3 HL Glycolic acid CAS 79-14-1 (33)
2-Hydroxyethanoic acid; HO.CH2.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

PuO2++ gl NaClO4 20°C 1.00M C T K1=2.16 B2=3.45 1974MTa (20620) 263
B3=4.25

PuO2++ gl NaClO4 20°C 1.00M U T K1=2.16 B2=3.45 1970PCb (20621) 264
B3=4.27

PuO2++ sp NaClO4 25°C 0.10M U T K1=2.43 B2=3.79 1968ESa (20622) 265

C3H5O2Cl HL CAS 107-94-8 (1436)
3-Chloropropanoic acid; Cl.CH2.CH2.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo

PuO2++ gl NaClO4 20°C 1.00M U K1=1.70 B2=2.95 1970PCb (24732) 266
B3=3.85

C4H6O4 H2L Succinic acid CAS 110-15-6 (112)

1,4-Butanedioic acid; HOOC.CH2.CH2.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	gl	NaClO4	30°C	0.50M	U		K1=3.03 B2= 5.42	1990PNa (30031)	267

C4H6O5		H2L					Diglycolic acid CAS 110-99-6	(243)	
Di(carboxy)methyl ether, 2,2'-Oxydiethanoic acid; <chem>HOOC.CH2.O.CH2.COOH</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	gl	NaClO4	20°C	1.00M	U		K1=4.97	1973CBc (30922)	268

C4H8O3		HL					CAS 594-61-6	(81)	
2-Hydroxy-2-methylpropanoic acid; <chem>(CH3)2C(OH).COOH</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	gl	NaClO4	20°C	1.00M	C	T	K1=3.04 B2=5.00 B3=6.00	1974MTa (33513)	269

C4H8O3		HL					CAS 591-81-1	(39)	
4-Hydroxybutanoic acid; <chem>HO.CH2.CH2.CH2.COOH</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	gl	NaClO4	20°C	1.00M	C		K1=2.06	1974MTa (33658)	270

C6H5NO2		HL					Picolinic acid CAS 98-98-6	(391)	
2-Pyridine-carboxylic acid; <chem>C5H4N.COOH</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	gl	NaClO4	25°C	0.10M	U		K1=4.58 K(PuO2HL=PuO2L+H)=-0.69	1970ERa (42592)	271

C6H5NO2		HL					Nicotinic acid CAS 59-67-6	(419)	
3-Pyridine-carboxylic acid; <chem>C5H4N.COOH</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	EMF	oth/un	25°C	0.10M	U		K1=1.73 K(PuO2+HL)=0.98	1970R0a (42685)	272

C6H5NO3		HHL					CAS 824-40-8	(878)	
Pyridine-2-carboxylic acid N-oxide (Picolinic acid N-oxide); <chem>C5H4N(O)COO</chem>									

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	EMF	oth/un	25°C	0.10M	U		K1=3.33	1970R0a (42840)	273

C10H16N2O8 H4L EDTA CAS 60-00-4 (120)
1,2-Diaminoethane-N,N,N',N'-tetraethanoic acid, Sequestic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
PuO2++	vlt	oth/un	20°C	?	U		K(PuO2+L)=14.6(9) K(PuO2+HL)=8.3(7) K(PuO2+H2L)=3.2(3)	1975CGa (74121)	274
PuO2++	ix	KCl	20°C	0.10M	U		K1=16.39	1957FSa (74122)	275

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EXPLANATORY NOTES

DATA Flags are :-

- T Data at other TEMPERATURES
- I Data with various BACKGROUNDS
- H Data for THERMOCHEMICAL quantities
- M Data for TERNARY Complexes

EVALUATION Flags are :-

T or IUP=T signifies EVALUATION RATING = Tentative by IUPAC

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