

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	NaClO ₄	25°C	0.10M	U	H		K1=0.57	1958MWa (5581)	4
Medium: HClO ₄ . 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	NaClO ₄	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+HP04+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		K(Pu+HL)=0.81 K(Pu+2HL)=0.68	1978RBa (16489)	22
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							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 K3=9.92 B2=18.70	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 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	1969M0c (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	1971M0c (33512)	40

Medium: NH4Cl

C5H8O7		H2L					CAS 40120-71-6	(3022)	
2,3,4-Trihydroxypentanedioic acid, Trihydroxyglutaric acid; HOOC.(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	1971M0c (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 1971M0c (47002) 44
K(Pu+L+HL)=13.53

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 NaClO4 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; HO3S.C6H3(OH).COOH

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

Pu+++ gl NaClO4 25°C 1.0M C K1=8.57 B2=17.51 1983Nca (55040) 47

Pu+++ gl NaClO4 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 NaClO4 23°C 0.2M U K1=-3.8 1975HHa (58671) 49
lg K(e)=-2.5

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

Pu+++ gl NaClO4 20°C 0.10M U K1=12.2 1973CGe (74110) 50
K(PuL+H)=4.2

K(PuL+H) by spectrophotometry

Pu+++ ix oth/un 20°C 0.10M U K1=25.75 1962KEa (74111) 51

Pu+++ ix KCl 20°C 0.10M U T K1=18.12 1957FSa (74112) 52

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

Pu+++ gl KCl 25°C 1.00M U K1=10.26 1978MGa (75483) 53

C14H22N2O8 H4L CDTA CAS 482-54-2 (200)
trans-1,2-Diaminocyclohexane-N,N,N',N'-tetraethanoic acid;

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

Pu+++ gl KCl 25°C 1.00M U K1=17.70 1978MGa (88764) 54

Pu+++ oth oth/un ? 0.0 U K1=21.3 1969MOc (88765) 55
Method: from survey of literature data

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+++ gl KCl 25°C 1.00M U K1=21.47 1978MGa (89368) 56

Pu+++ ix R4N.X 20°C 1.0M U K1=21.2 1971MOc (89369) 57
K(Pu+HL)=13.4

Medium: NH4Cl

Pu+++ oth oth/un ? 0.0 U K1=25.4 1969MOc (89370) 58

From survey of literature data

e- HL Electron (442)

Electron;

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

Pu++++ sp oth/un 400°C 100% U T H 1974LDb (842) 59
K=-1.47

Medium:(Li,Cs)Cl; K: Pu + Cl⁻=Pu++++ 1/2Cl₂(g); DH=59.4 kJ mol⁻¹.
K=-1.12(450 C), -0.80(500 C), -0.64(550 C)

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 1966DOa (2282) 69

Medium: HCl

CO3-- 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

*K3=-3.3
*K4=-6.3

Pu++++ sol none 24°C 0.0 U 1965PEb (12013) 111
Kso=-56.3 to -47.3

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++++ sol KCl 20°C 3.50M U 1958MGb (12015) 113
K(Pu(OH)4(s)=Pu(OH)4)=-5.16

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 NaClO4 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

Pu++++ sp oth/un 25°C 0.50M U 1949Cma (12696) 121
K(2Pu+H2L+H2O=Pu2LOH+3H)=6.94
K(2Pu+2H2L=Pu2L2+4H)=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=P+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=P+2H3L)=-7.5; Ks(Pu(HL)2(H2O)x(s)+4H=P+H3L+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	1983NCb (16493)	126
							K[Pu+H+2L]=6.28		
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=P+L+H)=2.82 K(Pu+2HL=P+L2+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.

Pu++++ dis NaClO4 23°C 2.0M U 1973PRa (16498) 131
*K1=2.7
*B2=4.4

Medium: HClO4

Pu++++ dis NaClO4 25°C 2.0M U T H 1973PRb (16499) 132
*K1=2.76
*K2=1.61

Medium: HClO4. DH(*K1)=-6.7 kJ mol⁻¹. At 10 C: *K1=2.81, *K2=1.56;
40 C: *K1=2.68, *K2=1.73

Pu++++ dis oth/un 25°C 2.33M U 1973SAf (16500) 133
*K1=2.9
*B2=4.7

Pu++++ sp KNO3 0.30M U K1=2.30 B2=5.00 1970M0a (16501) 134
Medium: HNO3

Pu++++ sol oth/un 0.30M U K1=2.30 B2=5.54 1969M0c (16502) 135
Range of methods used

Pu++++ dis NaClO4 ? 2.20M U 1964LPa (16503) 136
*K1=2.74
*K2=1.63

Pu++++ dis NaNO3 23°C 1.50M U 1964LUB (16504) 137
*K(PuL+HL=PuL2+H)=0.58

Pu++++ oth oth/un ? 2.30M U 1964PCa (16505) 138
*K1=2.87
*K2=1.78
*K3=0.70

Pu++++ ix NaClO4 ? 2.30M U I K1=2.48 1961Mca (16506) 139
*K1=1.40
Medium: HClO4. In 0.5 M *K1=0.98, *B2=1.30, *B3=2.10

Pu++++ EMF KCl 25°C 2.33M U I 1957Ksa (16507) 140
*K1=2.87 ?
*K2=3.04 ?
*K3=0.70 ?

Medium: HCl. In 1 M HClO4 *K1=3.04 ?

Pu++++ EMF NaClO4 25°C 1.0M U K1=3.66 1951RLa (16508) 141
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++++	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
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	1969M0c (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 NaClO4 25°C 0.10M U K1=5.3 B2=9.0 1962SNa (20149) 152
 B3=13.9
 B4=18.3
 B5=22.60

Medium: HClO4

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 NaClO4 25°C 0.50M U 1966NEa (25529) 153
 B4=16.2

C4H6O6 H2L L-Tartaric acid CAS 87-69-4 (92)
 L-Tartaric acid, L-2,3-Dihydroxybutanedioic acid; HOOC.CH(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 NaClO4 25°C 0.10M U 1960RYa (38069) 155
 B3=17.77
 K4=5.91

Pu++++ dis NaClO4 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; HOOCCH2.CH(OH)(COOH).CH2COOH

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

Pu++++ oth NaClO4 ? 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, Sequestric 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 1971M0c (89372) 168
Medium: NH4Cl

Pu++++ oth oth/un ? 1.0M U K1=29.4 1969M0c (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-(methylamido)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 1996WNa (106165) 176
 B(PuHL)=47.6

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 1980RSa (851) 177

K(e + PuO2+=PuO2)=14.8
 K(e + 2H2O+PuO2+=Pu(OH)4)=12.8
 Where PuO2 is crystalline and Pu(OH)4 is amorphous. Medium: 0.0015M CaCl2.

C03-- 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 1978MPa (3355) 178
 K(PuO2+2HL)=1.90

Medium: NH4Cl. Method: Coprecipitation

 PuO2+ sol oth/un 20°C 0 ? U K1=12 B2=15.06 1962Gmb (3356) 179
 B(PuO2(OH)L)=23.85
 B(PuO2(OH)2L)=23.0

Ks((NH4)2PuO2L2(s)=2NH4+PuO2L2)=-1.33

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

Medium: LiHCO3.

 PuO2+ sol none 25°C 0.0 U B2=15 1961GMa (3358) 181

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	NaClO4	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	NaClO4	25°C	3.00M	C			1975SCa (12025)	186
*B(2,2)=-8.23									
*B(7,4)=-29.13									

PuO2+	sol	KNO3	?	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, Sequestric 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

PuO2+ ix oth/un 20°C 0.05M U K1=10.2 1959GAa (74120) 203

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 TH 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
$K(2PuO_2+2H_2O=(PuO_2)_2(OH)_2+2H)=-8.01$ $K(4PuO_2+7H_2O=(PuO_2)_4(OH)_7+7H)=-29.32$ 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

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

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

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; HOOC.CH2.O.CH2.COOH

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; (CH3)2C(OH).COOH

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 1974MTa (33513) 269
B3=6.00

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

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; C5H4N.COOH

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

PuO2++ gl NaClO4 25°C 0.10M U K1=4.58 1970ERa (42592) 271
K(PuO2HL=PuO2L+H)=-0.69

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

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

PuO2++ EMF oth/un 25°C 0.10M U K1=1.73 1970R0a (42685) 272
K(PuO2+HL)=0.98

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

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, Sequestric acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg	K values	Reference	ExptNo
PuO2++	vlt	oth/un	20°C	?	U			1975CGa (74121)		274
								K(PuO2+L)=14.6(9)		
								K(PuO2+HL)=8.3(7)		
								K(PuO2+H2L)=3.2(3)		
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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