SC-Database
Software version = 5.81 Data version = 4.62
Experiment list contains 143 experiments for
 (no ligands specified)
 Metal : Hf++++
 (no references specified)
 (no experimental details specified)

****
e- HL Electron (442)
Electron;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ oth none 25°C 0.0 U 1952LAb (515) 1
K=-106(-1570 mV)
K: HfO2(s)+4H+4e=Hf(s)+2H2O. From thermodynamic data
****
Br- HL Bromide CAS 10035-10-6 (19)
Bromide;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis NaClO4 20°C 3.0M U K1=-0.1 1967HPc (1944) 2
****
CO3-- H2L Carbonate CAS 465-79-6 (268)
Carbonate;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis oth/un 20°C 1.00M U I 1987JBb (3235) 3
B4=39.83
When I=2.5 M: B5=40.21

Hf++++ gl KCl 25°C 1.00M U 1982KCc (3236) 4
K(Hf(OH)2L+L)=11.0
****
Cl- HL Chloride CAS 7647-01-0 (50)
Chloride;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis NaClO4 25°C 4.00M U M 1976TSa (4933) 5
K(HfOH+Cl)=-0.54

Hf++++ ix NaClO4 20°C 2.0M U K1=0.07 B2=-0.48 1967EMc (4934) 6
B3=-0.40

Hf++++ dis NaClO4 20°C 3.0M U K1=0.34 B2=-0.02 1967HPc (4935) 7
Medium: HClO4. By cation exchange:K1=0.18

```
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 27°C  2.0M U        K1=-0.15  B2=-0.32  1965DKa  (4936)   8
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  2.0M U        K1=0.38   B2=0.07   1963PAd  (4937)   9
                                         K3=-0.68
                                         K4=-0.7
                                         B4=1.3
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U  I     K1=-0.02  B2=-0.92  1962MRc  (4938)  10
                                         B3=-1.15
                                         B4=-1.10
Medium: HClO4. In 4 M HClO4 K1=-0.03, B2=-0.74, B3=-1.10
*******************************************************************************
F-                      HL    Fluoride         CAS 7644-39-3  (201)
Fluoride;
-------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------------
Hf++++     cal NaClO4 25°C  4.0M U   H                    1990AHa  (6938)  11
DH(Hf+HF=HfF+H)=15.2 kJ mol-1; DH(HfF+HF=HfF2+H)=15.0;
DH(HfF2+HF=HfF3+H)=8.8; DH(HfF3+HF=HfF4+H)=27.4
-------------------------------------------------------------------------------
Hf++++     gl  NaCl   37°C 0.15M C                      1985IWb  (6939)  12
                                         B(HfL4)=30.16
                                         B(HfL6)=40.48
-------------------------------------------------------------------------------
Hf++++     ISE NaClO4 25°C  4.0M U                      1973NOa  (6940)  13
                                         *K1=5.5
                                         *K2=4.01
Medium: HClO4. *Kn=HfF(n-1)+HF=HfFn+H
-------------------------------------------------------------------------------
Hf++++     ix  oth/un   ?     ?  U                      1972PAb  (6941)  14
                                         K6=3.83
-------------------------------------------------------------------------------
Hf++++     gl  NaClO4 25°C  3.0M U                      1969VAa  (6942)  15
                                         *K1=4.42
                                         *K2=3.12
                                         *K3=2.64
                                         *K4=1.9
Medium: (H,Na)ClO4. *K5=1.59, *K6=1.70. *Kn: HfF(n-1)+HF=HfFn+H
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 20°C  4.0M U                      1967NOa  (6943)  16
                                         K(Hg+HF=HfF+H)=5.52
                                         K(HfF+HF=HfF2+H)=4.04
                                         K(HfF2+F=HfF3+H)=3.04
                                         K(HfF3+HL=HfF4+H)=2.20
Medium: HClO4. *K5=1.7, *K6=0.5
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4 20°C  4.0M U                      1967NOa  (6944)  17
                                         K(Hf+HL=HfF+H)=5.51
```

K(HfF+HL=HfF2+H)=3.7?
Method: cation exchange. Medium: HClO4

Hf++++ ix KCl ? 0.50M U 1967PMd (6945) 18
K6=3.83

Hf++++ dis NaClO4 27°C 2.0M U 1965DKa (6946) 19
K(Hf+HL=HfF+H)=4.62
Medium: HClO4

Hf++++ dis oth/un 25°C 3.0M U 1964VHa (6947) 20
*K1=4.16
*B2=7.79
*B3=10.10
*B4=12.03
Medium:HClO4. *B6=12.62; HfF5 negligible. *Bn: K(Hf+nHF=HfFn+nH)

Hf++++ dis NaClO4 25°C 3.00M U 1963VHa (6948) 21
K(Hf+HF=HfF+H)=4.89
K(HfF+HF=HfF2+H)=3.67
K(HfF2+HF=HfF3+H)=2.97
K(HfF3+HF=HfF4+H)=2.77
Methdo: quinhydrone elec. *K5(HfF4+HF=HfF5+H)=1.55, *K6=2.54
****
I- HL Iodide CAS 10034-85-2 (20)
Iodide;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis NaClO4 20°C 3.0M U K1=-0.46 1967HPc (8029) 22
****
NO3- HL Nitrate CAS 7697-37-2 (288)
Nitrate;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis NaClO4 4.0M U K1=-0.4 B2=-1.3 1969HSb (9696) 23
Medium: HClO4

Hf++++ ix oth/un 20°C 2.0M U K1=-0.15 B2=-0.96 1967EMc (9697) 24

Hf++++ dis NaClO4 27°C 2.0M U K1=-0.1 1965DKa (9698) 25

Hf++++ dis NaClO4 25°C 2.0M U K1=0.34 B2=0.00 1963PAd (9699) 26
K3=-0.72
K4=-0.80
B4=-1.52

Hf++++ ix NaClO4 ? 4.0M U I K1=-0.22 B2=-0.92 1962MRc (9700) 27
Method: Cation exchange. Medium: HClO4. I=2 M: K1=-0.05, B2=-0.26

```
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 20°C  4.0M U    M   K1=0.92   B2=1.51   1962PBc  (9701)  28
                                         B3=1.89
                                         B4=2.08
                                         B5=2.08
                                         B6=1.81
Medium: HClO4. Kd(HfL4+2TBP(org)=HfL4(TBP)2(org)]=-0.12, org=hydrog.kerosene
********************************************************************************
OH-                    HL    Hydroxide          (57)
Hydroxide;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     dis oth/un 25°C 0.00  U                         1975CCa (11550)  29
                                         *B2=-24.4
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 20°C 4.00M U T                       1973NOa (11551)  30
                                         *K1=-0.2
Medium: HClO4; *K1=-1.1(25 C) determined with fluoride-ion selective
electrode
--------------------------------------------------------------------------------
Hf++++     sp  KNO3   25°C 0.10M U  I     K1=14.05  B2=27.66  1971NAd (11552)  31
                                         B3=40.86
                                         B4=53.37
K1=14.07, B2=27.65, B3=40.74, B4=53.54(I=0.3); K1=14.10, B2=27.68, B3=40.62,
B4=53.18(I=0.5); K1=14.15, B2=27.83, B3=41.07, B4=54.11(I=1)
--------------------------------------------------------------------------------
Hf++++     sp  none   20°C  0.0  U                       1962KBc (11553)  32
                                         Kso(Hf(OH)4)=-53.43
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  1.0M U                       1962PAc (11554)  33
                                         *K1=0.12
                                         *K2=-0.23
                                         *K3=-0.42
                                         *K4=-0.52
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  1.0M U                       1962PAc (11555)  34
                                         *B(3,4)=4.37
                                         *B(4,8)=8.00
--------------------------------------------------------------------------------
Hf++++     sol oth/un 25°C  1.0M U                       1960SPa (11556)  35
                                         K(Hf(OH)4(s)+OH=Hf(OH)5)=-3.2
--------------------------------------------------------------------------------
Hf++++     gl  oth/un 25°C  var  U                       1950LGa (11557)  36
                                         Ks(Hf(OH)4=Hf(OH)2+2OH)=-25.4
********************************************************************************
O2--                  H2L    Peroxide         CAS 7772-84-1  (2813)
Peroxide; -O.O-
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
```

```
--------------------------------------------------------------------------------
Hf++++     sp  oth/un 25°C  var  U                      1973KPf (12666)  37
                                        K(HfO+H2L)=1.9 to 4.5
--------------------------------------------------------------------------------
Hf++++     kin oth/un  0°C  var  U                      1970RAb (12667)  38
                                        K(Hf'+H2L)=5.1
[Hf']=[Hf(OH)]+[Hf(OH)2]+[Hf(OH)3]
********************************************************************************
PO4---                H3L    Phosphate        CAS 7664-38-2  (176)
Phosphate;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     sp  NaClO4 20°C 1.00M U                      1972DSg (13207)  39
                                        K(Hf+3HL)=1.57
********************************************************************************
SCN-                   HL    Thiocyanate      CAS 463-56-9  (106)
Thiocyanate;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 3.50M U    M                 1976TSa (15019)  40
                                        K(HfOH+SCN)=1.04
--------------------------------------------------------------------------------
Hf++++     dis NaClO4   ?   3.0M U        K1=1.13   B2=2.33   1971LFb (15020)  41
                                        B4=2.22
--------------------------------------------------------------------------------
Hf++++     sp  non-aq 20°C 100%  U  I     K1=1.77   B2=3.49   1970GLa (15021)  42
                                        B3=4.12
                                        B4=6.68
                                        B5=8.13
                                        B6=9.49
B7=10.79,B8=12.05; Medium: N,N-dimethylformamide. In acetonitrile,  B6=16.5
--------------------------------------------------------------------------------
Hf++++     sp  NaClO4   ?     ?  U  I     K1=2.6    B2=4.9    1966GSi (15022)  43
                                        B3=7.1
                                        B4=9.2
                                        B5=11.1
                                        B6=12.9
B7=14.7, B8=16.5; constants for 0.8 M H+. In 0.1 M H+: K1=2.0, B2=4.0,
B3=5.7, B4=7.2, B5=8.7, B6=10.0,B7=11.1,B8=12.2
********************************************************************************
SO4--                  H2L    Sulfate          CAS 7664-93-9  (15)
Sulfate;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     kin NaClO4 25°C 0.02M U                      1979ABb (16227)  44
K(Hf(OH)3+HSO4=Hf(OH)2SO4+H2O)=5.42; K(Hf(OH)2+2HSO4=Hf(OH)(SO4)2+2H2O)=9.11
--------------------------------------------------------------------------------
```

```
Hf++++     dis NaClO4 25°C 4.00M U        K1=1.00   B2=2.26   1976TSa (16228)  45
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  1.0M U                            1971LSa (16229)  46
                                       *K1=1.9
                                       *B2=2.8
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4 20°C  2.0M U        K1=3.10   B2=5.42   1967EMc (16230)  47
                                       B(HfLCl)=3.04
                                       B(HfL(NO3))=3.23
                                       B(HfL2(NO3))=5.7
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 27°C  2.0M U                            1965DKa (16231)  48
                                       *K1=2.04
                                       *B2=3.7
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?  2.30M U                            1964RMd (16232)  49
                                       *K1=2.11
                                       *B2=3.32
                                       *B3=6.48
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  2.0M U        K1=3.11   B2=5.48   1963PAd (16233)  50
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?  2.30M U                            1962REb (16234)  51
                                       *K1=2.11
                                       *B2=3.32
*******************************************************************************
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
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 4.00M U    M                       1976TSa (18915)  52
                                       K(HfOH+H2L=HfL+H)=4.40
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 20°C 2.00M U        K1=10.22  B2=18.88  1971NSa (18916)  53
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U  I                         1962MRb (18917)  54
                                       K(Hf+H2L=HfL+2H)=5.2
                                       K(Hf+2H2L=HfL2+4H)=9.7
Medium: HClO4. I=4: K(Hf+H2L=HfL+2H)=5.2
*******************************************************************************
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
-------------------------------------------------------------------------------
Hf++++     kin none   25°C 0.00  U    M                       1973VPa (19981)  55
                                       K(Hf(OH)2+L)=6.71
-------------------------------------------------------------------------------
Hf++++     EMF oth/un 25°C 0.01M U    M                       1969KPb (19982)  56
```

K(Hf(OH)3+L)=3.03
K(Hf(OH3)3L)=1.90
Medium: 0.01 HfOCl2
****
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
---
Hf++++ dis NaClO4 25°C 2.00M U K1=4.94 B2=9.85 1981HLa (20553) 57
Medium: 2.0 M HClO4

Hf++++ kin oth/un 25°C 0.10M U I 1973KPg (20554) 58
K(Hf(OH)2+L)=7.3
I=0: K=7.3; I=0.01: K=7.1
****
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
---
Hf++++ kin oth/un 25°C 0.10M U 1971KPc (21570) 59
K(Hf(OH)3+L)=1.46
****
C2H8O7P2 H5L CAS 76267-75-9 (4226)
2-Hydroxyethylidenediphosphonic acid; HO.CH2.CH(PO3H2)2

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ sp oth/un 25°C 2.0M U 1999VKa (23409) 60
K(Hf+H3L=HfH3L)=7.97
In 2.0 M HClO4, T=room
****
C3H2O5 H2L Mesoxalic acid (3544)
Oxopropanedioic acid; HOOC.CO.COOH (Ketomalonic acid)

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ ix NaClO4 ? 2.0M U K1=4 1960REa (23489) 61
****
C3H4N2 L Imidazole CAS 288-32-4 (90)
1,3-Diazole, imidazole; C3H4N2

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ gl KNO3 25°C 0.10M C H K1=7.02 1976EWa (23897) 62
By calorimetry: DH=-33.27 kJ mol-1, DS=22.74
****
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
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 2.00M U        K1=5.61   B2=11.04  1981HLa (25457)  63
                                         B3=15.30
Medium: 2.0 M HClO4
--------------------------------------------------------------------------------
Hf++++     ix  NaClO4 25°C  2.0M U                     1964RMd (25458)  64
                                         K(Hf+HL=HfL+H)=1.73
                                         K(Hf+2HL=HfL2+2H)=2.0
--------------------------------------------------------------------------------
Hf++++     ix  oth/un   ?   2.0M U                     1960REa (25459)  65
                                         K(Hf+HL=HfL+H)=1.73
********************************************************************************
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
--------------------------------------------------------------------------------
Hf++++     kin oth/un 25°C 0.10M U                     1973WIa (27138)  66
                                         K(Hf(OH)3+HL)=1.28   pH 2
********************************************************************************
C3H12NO9P3             H6L    NTPA             CAS 6419-19-8  (2920)
Nitrilotris(methylenephosphonic acid); N(CH2PO3H2)3
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     sp  oth/un 25°C  2.0M U                     1999VKa (28571)  67
                                         K(Hf+H3L=HfH3L)=12.51
In 2.0 M HClO4, T=room
********************************************************************************
C4H6O5                 H2L    Malic acid       CAS 617-48-1  (393)
2-Hydroxybutane-1,4-dioic acid, Hydroxy-succinic acid; HOOC.CH2.CH(OH).COOH
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 2.00M U        K1=4.81   B2=8.98   1981HLa (30641)  68
                                         B3=15.82
Medium: 2.0 M HClO4
--------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U                     1964RMd (30642)  69
                                         K(Hf+H2L=HfHL+H)=1.83
Medium: HClO4
--------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U  I                  1960REa (30643)  70
                                         K(Hf+H2L=HfHL+H)=1.53
Medium: HClO4. K=2.16(I=1)
********************************************************************************
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
-------------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 2.00M U        K1=4.68   B2=8.68   1981HLa (31268)  71
Medium: 2.0 M HClO4
-------------------------------------------------------------------------------
Hf++++     sp  KCl    25°C 1.00M U                      1978KKf (31269)  72
                                        K(Hf(OH)+HL)=8.55
-------------------------------------------------------------------------------
Hf++++     EMF oth/un 25°C    ?  U                      1970KKb (31270)  73
                                        K(Hf(OH)3+L)=6.03
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U                      1964RMd (31271)  74
                                        K(Hf+H2L=HfHL+H)=2.99
-------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   1.0M U  I                   1960REa (31272)  75
                                        K(Hf+H2L=HfHL+H)=2.45
Medium: HClO4
-------------------------------------------------------------------------------
Hf++++     dis NaClO4   ?   2.0M U                      1959REa (31273)  76
                                        K(Hf+H2L=HfHL+H)=1.69
Medium: HClO4
*******************************************************************************
C4H6O6                H2L    meso-Tartaric    CAS 147-73-9  (91)
meso-2,3-Dihydroxybutanedioic acid; HOOC.CH(OH).CH(OH).COOH
-------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------------
Hf++++     sp  KCl    25°C 1.00M U                      1978KKf (31429)  77
                                        K(Hf(OH)+HL)=8.70
*******************************************************************************
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
-------------------------------------------------------------------------------
Hf++++     EMF KNO3   35°C 0.10M U        K1=10.9        1978RSa (32270)  78
*******************************************************************************
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
-------------------------------------------------------------------------------
Hf++++     dis oth/un 25°C  1.0M U        K1=7.40   B2=14.68  1961PAa (37984)  79
                                        K3=6.74
                                        K4=6.68
*******************************************************************************
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
Hf++++	sp	KCl	25°C	1.00M	U		1978KKf (38424)		80
							K(Hf(OH)+HL)=9.37		
Hf++++	EMF	oth/un	25°C	0.10M	U		1970KKb (38425)		81
							K(Hf(OH)3+L)=6.50		
Hf++++	ix	NaClO4	?	2.0M	U		1964RMd (38426)		82
							K(Hf+H2L=HfHL+H)=2.72		
							K(Hf+2H2L=Hf(HL)2+2H)=5.2		
Hf++++	ix	NaClO4	?	2.0M	U		1960REa (38427)		83
							K(Hf+H2L=HfHL+H)=2.42		
							K(Hf+2H2L=Hf(HL)2+2H)=4.9		

Medium: HClO4

****

C6H2O4Cl2 H2L Chloranilic acd CAS 87-88-7 (1281)
3,6-Dichloro-2,5-dihydroxy-1,4-benzoquinone;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	sp	NaClO4	25°C	3.0M	U		1967VVb (42054)		84
							K(Hf+H2L=HfL+2H)=3.73		
							K(Hf+3H2L=HfL3+6H)=11.63		

Medium: HClO4

****

C6H6O2 H2L Catechol CAS 120-80-9 (534)
1,2-Dihydroxybenzene, pyrocatechol; HO.C6H4.OH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	ix	NaClO4	?	1.0M	U		K1=22.58	1967EKb (43771)	85

Medium: HClO4

****

C6H6O3 H3L Pyrogallol CAS 87-66-1 (696)
1,2,3-Trihydroxybenzene; C6H3(OH)3

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	sp	KCl	19°C	0.10M	U	I		1966PRc (43963)	86

K(Hf(OH)3+H3L=Hf(OH)2HL+H)=4.44(I=0), 4.33(I=0.1)

****

C6H6O3 HL Maltol CAS 118-71-8 (2442)
3-Hydroxy-2-methyl-4H-pyran-4-one;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	dis	NaClO4	20°C	1.00M	U	I	K1=13.16 B2=24.48	1972HSc (44090)	87

Medium: HClO4. I=2.0 M, K1=13.24, B2=24.18

```
**************************************************************************
C6H6O4                 HL    Kojic acid       CAS 501-30-4  (1800)
5-Hydroxy-2-(hydroxymethyl)-4H-pyran-4-one;
--------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------
Hf++++     dis NaClO4 20°C 1.00M U  I     K1=12.04  B2=22.59  1972HSc (44221)  88
Medium: HClO4. I=2.0 M, K1=12.20
**************************************************************************
C6H6O8S2               H4L    Tiron            CAS 149-45-1  (104)
4,5-Dihydroxybenzene-1,3-disulfonic acid; (HO)2.C6H2(SO3H)2
--------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   1.0M U  I     K1=23.00       1967EKb (44456)  89
                                         K(Hf+H2L=HfL+2H)=2.61
                                         K'(Hf+2H2L=HfL2+4H)=4.05
Medium: HClO4. K=3.15(I=0.5), 2.28(I=2.0); K'=4.4(I=0.5)
--------------------------------------------------------------------------
Hf++++     dis NaClO4   ?  0.20M U        K1=24.66       1966KEa (44457)  90
                                         B3=66.92
Medium: HClO4
**************************************************************************
C6H8O6                 H2L    Ascorbic acid    CAS 50-81-7  (285)
Ascorbic acid (Vitamin C);
--------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------
Hf++++     sp  oth/un   ?     ?  U        K1=8.0         1966SAb (45642)  91
                                         K(Hf+HL)=4.2
**************************************************************************
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
--------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C 2.00M U        K1=5.33   B2=9.11   1981HLa (46128)  92
Medium: 2.0 M HClO4
--------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?   2.0M U                       1964RMd (46129)  93
                                         K(Hf+H3L=HfH2L+H)=2.54
--------------------------------------------------------------------------
Hf++++     ix  oth/un   ?   2.0M U                       1960REa (46130)  94
                                         K(Hf+H3L=HfH2L+H)=2.24 ?
Medium: 2 M HClO4. K=3.05(?)(I=1)
**************************************************************************
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
```

Hf++++ cal oth/un 25°C 0.0 U TIH 1981VBa (46846) 95
DH(K1)=20.7 kJ mol-1

Hf++++ ix NaClO4 ? 0.23M U K1=20.34 1966EMd (46847) 96

Hf++++ ix NaClO4 ? 2.0M U I 1964EMc (46848) 97
K(Hf+H3L=HfL+3H)=3.83
Medium: HClO4. K=5.05(I=1)
****
C6H10O8 H2L Mucic acid CAS 526-99-8 (3650)
2,3,4,5-Tetrahydroxyhexanedioic acid, Galactaric acid; HOOC.(CHOH)4.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ sp KCl 25°C 1.00M U 1978KKf (48436) 98
K(Hf(OH)+HL)=9.68
****
C6H10O8 H2L Saccharic acid CAS 87-73-0 (1191)
D-2,3,4,5-Tetrahydroxy-1,6-hexanedioic acid, Glucaric acid; HOOC.(CHOH)4.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ ix NaClO4 20°C 2.0M U 1963RCa (48476) 99
K(Hf+H2L=HfL+2H)=2.29
Medium: HClO4
****
C6H11NO5 H2L HIMDA CAS 93-62-9 (192)
N-(2-Hydroxyethyl)iminodiethanoic acid; HO.CH2.CH2.N(CH2.COOH)2

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ EMF KNO3 35°C 0.10M U K1=9.7 1978RSa (48740) 100
K(HfL(OH)+H)=8.65

Hf++++ ix NaClO4 ? 0.23M U K1=14.63 1966EMd (48741) 101
Medium: HClO4
****
C6H12O7 HL Gluconic acid CAS 526-95-4 (904)
D-Gluconic acid, 2,3,4,5,6-Pentahydroxyhexanoic acid; HO.CH2(CHOH)4.COOH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ ix NaClO4 20°C 2.0M U 1963RCa (49722) 102
K(Hf+HL=HfL+H)=1.49
Medium: HClO4
****
C7H6O3 H2L Salicylic acid CAS 69-72-7 (14)
2-Hydroxybenzoic acid, Salicylic acid; HO.C6H4.COOH

```
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------
Hf++++     kin oth/un 25°C    ?  U                        1969KMf (54231) 103
                                          K(Hf(OH)3+HL)=5.5
*************************************************************************
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
-------------------------------------------------------------------------
Hf++++     kin oth/un 25°C    ?  U                        1969KMf (55012) 104
                                          K(Hf(OH)3+HL)=6.5
*************************************************************************
C7H7NO2               H2L    Salicylaldoxime  CAS 94-67-7  (1486)
2-Hydroxybenzaldehyde oxime; HO.C6H4.CH:N.OH
-------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------
Hf++++     gl  KCl    25°C 0.10M U  I     K1=11.05         1968MDe (55310) 105
K1=16.7(I=0),15.82(I=0.01),14.15(I=0.025),13.00(I=0.05),12.30(I=0.075)
*************************************************************************
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
-------------------------------------------------------------------------
Hf++++     dis oth/un 25°C  1.0M U        K1=10.60  B2=21.44  1962PAa (58628) 106
                                          B3=31.50
                                          B4=41.52
*************************************************************************
C8H5O2F3Se             HL                       CAS 713-15-5  (3842)
4,4,4-Trifluoro-1-(2'-selenoyl)-butane-1,3-dione; F3C.CO.CH2.CO.C4H3Se
-------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------
Hf++++     dis oth/un 20°C  1.0M U        K1=10.46  B2=20.74  1962PAa (58703) 107
                                          B3=30.22
                                          B4=39.70
*************************************************************************
C8H7O3Br               HL                       CAS 1878-91-7  (3819)
2-(4'-Bromophenyl)-2-hydroxyethanoic acid, p-bromomandelic acid;
-------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
-------------------------------------------------------------------------
Hf++++     dis NaClO4 25°C  1.0M U        K1=7.00   B2=13.15  1961AHa (59244) 108
                                          K3=6.61
                                          K4=6.26
Medium: HClO4
*************************************************************************
C8H8O2                 HL    Phenylacetic     CAS 103-82-2  (1361)
```

Phenylethanoic acid; C6H5.CH2.COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	kin	none	25°C	0.0	M			1973KPg (59548)	109
							K(Hf(OH)2+2L)=7.0		

****

C8H8O3 HL Mandelic Acid CAS 611-72-3 (80)
2-Phenyl-2-hydroxyethanoic acid; C6H5.CH(OH).COOH

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	dis	NaNO3	25°C	1.0M	U			1971PKb (59839)	110
							K(HfO+2H-1L)=17.74 (?)		

****

C10H6O8Cl2S2 H4L CAS 6155-33-5 (4761)
2,7-Dichlorochromotropic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	sp	oth/un	?	?	U			1973DMb (68536)	111
							K(Hf(OH)2+2HL)=12.64		

****

C10H6O9S2 H3L CAS 58425-39-1 (2004)
8-Hydroxy-1,2-naphthoquinone-3,6-disulfonic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	sp	NaClO4	20°C	0.10M	U			1975MDa (68540)	112
							B(Hf(OH)2L2)=17.66		

****

C10H10O2 HL Benzoylacetone CAS 93-91-4 (197)
1-Phenylbutane-1,3-dione; C6H5.CO.CH2.CO.CH3

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	dis	NaClO4	25°C	1.00M	C			1975LUa (70733)	113
							Kd(Hf)=0.6		
							K(HfL4=HfL4(org)=3.6		

Organic phase=benzene; B(HfO+4L+2H=HfL4+H2O)=41.8
Kd(Hf): HfO+4HL(org)=HfL4(org)+2H+H2O

****

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
Hf++++	ISE	KNO3	25°C	0.10M	C	M		1996YHa (73830)	114
							K(HfL+F)=4.56		
							K(HfLF+F)=2.9		

Method: Fluoride ISE.

Hf++++ EMF KNO3 35°C 0.10M U 1978RSa (73831) 115
K(HfL(OH)+H)=5.24
K(2HfL(OH)2+2H=2HfL)=9.00

Hf++++ sp KCl 25°C 0.50M U K1=15.1 1978TSa (73832) 116

Hf++++ ix NaClO4 ? 0.23M U K1=29.5 1966EMd (73833) 117
Medium: HClO4

****

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

---

Hf++++ ISE KNO3 25°C 0.10M C M 1996YHa (75410) 118
K(HfL+F)=5.37
K(HfLF+F)=3.82
K(HfH-1L+H)=1.55
K(HfH-1L+F)=2.9
Method: Fluoride ISE. K(HfH-1LF+F)=1.9.

Hf++++ EMF KNO3 35°C 0.10M U 1978RSa (75411) 119
K(HfL(OH)+H)=9.24
K(2HfL(OH)2+2H=2HfL)=16.15

****

C11H9N3O2 H2L PAR CAS 1141-59-9 (636)
4-(2'-Pyridylazo)-1,3-dihydroxybenzene; C5H4N.N:N.C6H3(OH)2

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

---

Hf++++ vlt alc/w 25°C 50% U 1975TBa (77548) 120
K(Hf(OH)3+HL)=16.9
Medium: 50% EtOH/H2O

****

C11H12O9 H3L CAS 69065-58-3 (2714)
1,2,4-Trihydroxy-3,4,5-trimethoxycarbonylcyclopentadiene;

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

---

Hf++++ sp NaCl 19°C 0.1M U 1977LBa (78428) 121
K(Hf(OH)2+HL)=13.28
K(Hf(OH)3+HL)=12.15

****

C11H18N2O8 H4L CAS 4408-81-5 (923)
1,3-Diaminopropane-N,N,N',N'-tetraethanoic acid; ((HOOC.CH2)2N.CH2.)2.CH2

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

---

Hf++++ dis NaClO4 ? 1.0M U K1=27.65 1968EMa (79447) 122
K(Hf+2HL)=54.43
****
C12H12Si L (6825)
Diphenylsilane;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ nmr non-aq 25°C 100% U M 1992WHa (81170) 123
K(HfABCD+L=HfABC(H-1L)+E)=-0.3
Method:NMR. Medium:benzene. A:cyclopentadienide. B:pentamethylcyclopenta-
dienide. C:Cl. D:Si(C6H11)H2. E:Si(C6H11)H3.
****
C12H19O3P HL CAS 66170-45-4 (8310)
Phenylphosphonic acid monohexyl ester;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis NaCl RT 2.0M C 1977NAc (81992) 124
K(Hf+5HL(org)+Cl=HfL3Cl(HL)2(org)+3H)=23.3
Method: extraction from 2.0 M NaCl solution into benzene.
****
C12H27O4P L CAS 126-73-8 (2432)
Tri-n-butyl phosphate; (C4H9O)3PO

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis oth/un 20°C ? U K1=-0.12 1962PBa (84120) 125
Metal: Hf+++
****
C12H27O6P HL CAS 14260-97-0 (8268)
Di-(n-butoxyethyl)phosphoric acid;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ dis non-aq RT 100% C 1977NAb (84126) 126
Medium: benzene. By distribution from 2 M NaCl/HCl or 2 M NaClO4/HClO4.
K(Hf+6HL(org)=HfL4(HL)2(org)+4H)=27.1
****
C13H11NO2 HL CAS 304-88-1 (181)
N-Phenylbenzohydroxamic acid; C6H5.CO.N(C6H5).OH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ sp NaClO4 25°C 1.0M U K1=13.66 B2=26.90 1968FOa (85155) 127
K3=12.25
K4=12.15
****
C14H8O7S H3L DASA CAS 83-61-4 (950)
1,2-Dihydroxyanthraquinone-3-sulfonic acid, Alizarin Red S;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ sp oth/un 25°C ? U 1962BDa (86733) 128
K(?)=10.4

Hf++++ sp oth/un 25°C ? U B2=10.4 1959DBb (86734) 129
****
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
---
Hf++++ ISE KNO3 25°C 0.10M C M 1996YHa (88673) 130
K(HfL+F)=4.50
K(HfLF+F)=3.1
Method: Fluoride ISE.
****
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
---
Hf++++ ix NaClO4 ? 0.23M U K1=35.40 1966EMd (89271) 131

Hf++++ ix NaClO4 ? 2.0M U I 1964EMd (89272) 132
K(Hf+H5L=HfL+5H)=3.13
Medium: HClO4. K=4.86(I=1)
****
C15H11N3O HL PAN CAS 85-85-8 (572)
1-(2-Pyridylazo)-2-naphthol; C5H4N.N:N.C10H6.OH

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ vlt alc/w 25°C 50% U 1975TBa (91220) 133
K(Hf(OH)3+HL)=14.4
Medium: 50% EtOH/H2O
****
C16H11N3O10S2 H4L (5174)
2-Hydroxy-1-(2'-hydroxy-4'-nitro)phenylazo-3,6-disulfonaphthalene;

Metal Mtd Medium Temp Conc Cal Flags Lg K values Reference ExptNo
---
Hf++++ sp oth/un 25°C ? U 1971RCd (92881) 134
K(?)=5.33
****
C16H12O6 H2L CAS 475-25-2 (5141)
Hematein, haematin;

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

```
--------------------------------------------------------------------------------
Hf++++     sp  oth/un 20°C 0.10M U                        1973DVa (93154) 135
                                        K(HfO+2L)=6.20    pH=2
********************************************************************************
C16H13N2O10AsS2       H5L    Thorin I         CAS 3688-92-4  (2609)
1-((2-Arsonophenyl)azo)-2-hydroxy-3,6-naphthalyldisulfonic acid;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     sp  oth/un 25°C    ?  U                        1966SAd (93194) 136
                                        K(?)=8.2
********************************************************************************
C16H27O3P              HL                    CAS 52299-33-9  (8311)
Phenylphosphonic acid monodecyl ester;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     dis NaCl    RT   2.0M C                        1977NAc (94696) 137
K(Hf+3HL(org)+Cl=HfL3Cl(org)+3H)=12.4
Method: extraction from 2.0 M NaCl solution into benzene.
********************************************************************************
C18H30N4O12           H6L    TTHA             CAS 869-52-3  (694)
Triethylenetetraaminehexaethanoic acid;((HOOC.CH2)2N.CH2.CH2.N(CH2.COOH).CH2)2
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     ISE KNO3   25°C 0.10M C    M                  1996YHa (98044) 138
                                        K(HfHL+F)=5.58
                                        K(HfL+H)=3.86
                                        K(HfL+F)=2.8
Method: Fluoride ISE.
--------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?  0.50M U  I     K1=19.08       1966EMc (98045) 139
                                        K(Hf(OH)+H6L=HfH2L+3H)=3.90
Medium: HClO4. K(Hf+H6L=HfH2L+4H)=3.5(I=2), 2.84(I=2)
********************************************************************************
C22H37N5O14           H7L                   CAS 3234-59-1  (2425)
Tetraethylenepentamineheptaethanoic acid;
--------------------------------------------------------------------------------
Metal      Mtd Medium Temp Conc Cal Flags Lg K values       Reference ExptNo
--------------------------------------------------------------------------------
Hf++++     ix  NaClO4   ?  0.20M U  I                     1966EMc (102328) 140
                                        K(Hf(OH)+H7L=HfH4L+2H)=6.11
Medium: HClO4. K(Hf(OH)+H7L=HfH4L+2H)=5.72(I=0.5)
K(Hf+H7L=HfH4L+3H)=5.18(I=1), 4.23(I=2)
********************************************************************************
C23H24N4O2              L    Trichachnine     CAS 1251-85-0  (2606)
4,4'-Diantipyrylmethane,
4,4'-phenylmethylene-bis-(1,2-dihydro-1,5-dimethyl-2-phenylpyrazol-3-one
--------------------------------------------------------------------------------
```

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values		Reference	ExptNo
Hf++++	sp	KCl	25°C	0.10M	U		K1=7.82	B2=11.92	1982SKb (102673)	141
Hf++++	dis	oth/un	RT	2.0M	M		B2=7.40 B3=11.20		1975HSa (102674)	142

Medium: 2 M HCl. Extraction into benzene from 2 M HCl, using 181Hf.

****

C31H32N2O13S H6L Xylenol orange CAS 63721-85-5 (432)
5,5'-Bis-N,N-bis(carboxymethyl)aminomethyl-4'-hydroxy-3,3'-dimethylfuchsone-2"-sulfonic acid;

Metal	Mtd	Medium	Temp	Conc	Cal	Flags	Lg K values	Reference	ExptNo
Hf++++	sp	NaClO4	?	0.30M	U		K(?)=6.51	1960CHa (105472)	143

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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

END