A-1756

PDR - 1
LPDR -
WM-10 (2)
WM-11 (2)
WM-16 (2)

426.1 WRK/87/03/06

WM-RES
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A-1756
SNL

WM Project 10, 11, 16
Docket No.
PDR —
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Distribution:

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MAR 9 - 1987

Dr. David Garvin
Chemistry B348
Chemical Thermodynamics Data Center
National Bureau of Standards
Gaithersburg, MD 20899

Dear Dr. Garvin:

Enclosed please find "Reaction Blocks" for 13 reactions (15 measurements) involving plutonium. Not being a thermodynamicist, I must admit to a certain uneasiness in evaluating the data. I have only submitted data that have been assigned uncertainties by the investigators themselves or by other evaluators; I do not know how to properly assign uncertainties myself. For the reactions involving aqueous species alone, most results were reported as β's. I have taken the logarithm of these values and calculated ΔG° from the relation $\Delta G^\circ = -1.364 \log K$. I hope this is the proper procedure.

Thank you very much for your guidance and assistance in this matter. Please call me (427-4571) if you need any clarifications on the enclosed material. I look forward to hearing from you again.

Sincerely,

/S/

Walton R. Kelly
Geochemistry Section
Geotechnical Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure:
As stated

8706160254 870309
PDR WMRES EXISANL
A-1756 PDR

8705007315 H
3693

3857

Enclosure

Z: 73MET: Metivier, H.; CEA-R-4477 (1973)

R: $Pu^{4+} + H_2O = PuOH^{3+} + H^+$
DV: G, 0.68 $ 0.2 kJ
S: WRK87

Z: 73MET: Metivier, H.; CEA-R-4477 (1973)

R: $Pu^{4+} + 2H_2O = Pu(OH)_2^{2+} + 2H^+$
DV: G, 1.64 $ 0.5 kJ
S: WRK87

Z: 73MET: Metivier, H.; CEA-R-4477 (1973)

R: $Pu^{4+} + 3H_2O = Pu(OH)_3^{+} + 3H^+$
DV: G, 6.14 $ 0.5 kJ
S: WRK87

Z: 73MET: Metivier, H.; CEA-R-4477 (1973)

R: $Pu^{4+} + 4H_2O = Pu(OH)_4^{\circ} + 4H^+$
DV: G, 14.73 $ 1.0 kJ
S: WRK87

Z: 76BAG/RAM: Bagawde, S.V.; Ramakrishna, V.K.; Patil, S.K.; J. Inorg. Nucl. Chem.; 38, 1339 (1976)

R: $Pu^{4+} + Cl^- = PuCl^{3+}$
DV: G, -0.21 $ 0.05 kJ
S: WRK87

Z: 76BAG/RAM: Bagawde, S.V.; Ramakrishna, V.K.; Patil, S.K.; J. Inorg. Nucl. Chem.; 38, 1339 (1976)

R: $Pu^{4+} + 2Cl^- = PuCl_2^{2+}$
DV: G, 0.87 $ 0.1 kJ
S: WRK87

Z: 76BAG/RAM: Bagawde, S.V.; Ramakrishna, V.K.; Patil, S.K.; J. Inorg. Nucl. Chem.; 38, 1339 (1976)

R: $Pu^{4+} + F^- = PuF^{3+}$
DV: G, -6.33 $ 0.01 kJ
S: WRK87

Z: 75SCH: Schedin, U.; Acta. Chem. Scand.; 29, 333 (1975)

R: $2PuO_2^{2+} + 2H_2O = (PuO_2)_2(OH)_2^{\circ} + 2H^+$
DV: G, 11.23 $ 0.2 kJ
S: WRK87

Z: 75SCH: Schedin, U.; Acta. Chem. Scand.; 29, 333 (1975)

R: $4PuO_2^{2+} + 7H_2O = (PuO_2)_4(OH)_7^+ + 7H^+$
DV: G, 39.71 $ 0.3 kJ
S: WRK87

Z: 65MAZ/SEV: Mazumdar, A.S.; Sivaramakrishnan, C.K.; J. Inorg. Nucl. Chem.; 27, 2423 (1965)

R: $PuO_2^{2+} + Cl^- = PuO_2Cl^+$
DV: G, 0.0 $ 0.1 kJ
S: WRK87

Z: 65MAZ/SEV: Mazumdar, A.S.; Sivaramakrishnan, C.K.; J. Inorg. Nucl. Chem.; 27, 2423 (1965)

R: $PuO_2^{2+} + 2Cl^- = PuO_2Cl_2^\circ$
DV: G, 1.05 $ 0.2 kJ
S: WRK87

Z: 66RAN: Rand, R.H.; At. Energy Rev. 4, Spec. Issue No. 1, 7 (1966)

R: $PuO_2(s) + 4H^+ = Pu^{4+} + 2H_2O$
DV: H, -1057.7 $ 1.0 kJ
S: WRK87

Z: 76FLO/OSB: Flotow, H.E.; Osborn, D.E.; Fried, S.M.; Malm, J.G.; J. Chem. Phys.; 65, 1124 (1976)

R: $PuO_2(s) + 4H^+ = Pu^{4+} + 2H_2O$
DV: S, 66.13 $ 0.26 J
S: WRK 87

Z: 66RAN: Rand, R.H.; At. Energy Rev. 4, Spec. Issue No. 1, 7 (1966)

R: $PuF_4(s) = Pu^{4+} + 4F^-$
DV: H, -1778.2 $ 1.0 kJ
S: WRK87

Z: 75OSB/FLO: Osborn, D.E.; Flotow, H.E.; Fried, S.M.; Malm, J.G.; J. Chem. Phys.; 63, 4613 (1975)

R: $PuF_4(s) = Pu^{4+} + 4F^-$
DV: S, 147.25 $ 0.37 J
S: WRK87