NATIONAL BUREAU OF STANDARDS REPORT

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ELECTROCHEMICAL DATA

PART XIII

OSMOTIC COEFFICIENTS AND MEAN ACTIVITY COEFFICIENTS OF A SERIES OF UNI–UNIVALENT ELECTROLYTES IN AQUEOUS SOLUTIONS AT 25 °C.

Prepared for

National Aeronautics and Space Administration

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U.S. DEPARTMENT OF COMMERCE

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PART XIII

OSMOTIC COEFFICIENTS AND MEAN ACTIVITY COEFFICIENTS OF A SERIES OF UNI-UNIVALENT ELECTROLYTES IN AQUEOUS SOLUTIONS AT 25 °C.

by
Yung-Chi Wu and Walter J. Hamer

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Electrochemical Data. XIII. Osmotic Coefficients and Mean Activity Coefficients of a Series of Uni-univalent Electrolytes in Aqueous Solutions at 25 °C.

ABSTRACT

This report gives the osmotic coefficients and the mean activity coefficients of a series of uni-univalent electrolytes in aqueous solutions at 25 °C. The values are expressed on the molality or weight basis. The electrolytes treated are: NaF, KF, RbF, CsF, $NaClO_3$, $KClO_3$, $NaBrO_3$, $KBrO_3$, $HClO_4$, $LiClO_4$, $NaClO_4$, $TlClO_4$, LiOH, NaOH, KOH, CsOH, HNO_3, $LiNO_3$, $NaNO_3$, KNO_3, $RbNO_3$, $CsNO_3$, $AgNO_3$, NH_4Cl, NH_4NO_3, NH_4ClO_4, NaCNS, KCNS, NaH_2PO_4, KH_2PO_4, NaH_2AsO_4, and KH_2AsO_4.

I. Introduction

This report represents a continuation of the work presented in Electrochemical Data, Part XI. Again the literature data were fitted to the equation for the excess Gibbs energy (free energy):

$$\Delta G^{ex} = \nu m\, RT\, (1-\phi_m + \ln \gamma) \qquad (1)$$

where ν is the number of ions into which one molecule of solute (electrolyte) dissociates, m is molality, R the gas constant, T the Kelvin temperature, ϕ the osmotic coefficient, and γ the activity coefficient on the molality scale. Values of ΔG^{ex} as a function of m were determined by using the following equations for ϕ and γ:

$$\phi_m = 1 - 2.302585 \frac{|z_+ z_-| A_m}{(B_m^*)^3 m} \left[1 + B_m^*\sqrt{m} - 2 \ln (1 + B^* \sqrt{m}) - 1/(1 + B_m^*\sqrt{m})\right]$$
$$+ 2.302585 \left[\beta m/2 + 2Cm^2/3 + 3Dm^3/4 + 4Em^4/5 + \dots\right] \qquad (2)$$

and

$$\ell og\ \gamma = -\frac{|z_+z_-|A_m\sqrt{m}}{1 + B_m^*\sqrt{m}} + \beta m + Cm^2 + Dm^3 + Em^4 + \ldots \quad (3)$$

Substitution of equations (2) and (3) in (1) gives ΔG^{ex} as a function of m, namely:

$$\Delta G^E = \nu RT\ (2.302585) \left\{ \left(|z_+z_-| A_m/(B_m^*)^3 \right) \left[(2 - B_m^*\sqrt{m}) B_m^*\sqrt{m} - 2\ \ell n\ (1 + B_m^*\sqrt{m}) \right] + \beta m^2/2 + Cm^3/3 + Dm^4/4 + Em^5/5 + \ldots \right\} \quad (4)$$

The parameters B_m^*, β, C, D, and E were then obtained by least squares using a computer program. These parameters were then used to express ϕ and $\ell og\ \gamma$ individually by equations (2) and (3) above. The standard deviations of the fit of these equations are denoted, respectively, by S_ϕ and S_γ and are given at the bottom of each table. In these least square fits values of B_m^* were selected that made S_ϕ and S_γ minimal. Terms with coefficients of D and E were required only for those electrolytes for which data were available at very high concentrations (above about 3M). [Note: inadvertently, in report Electrochemical Data, Part XI the ion-size parameter, a, was omitted from equations III.9, III.10, and III.11. In each equation the constant B should be replaced by the notation $B_m a$ where the subscript m means molality and makes the constant consistent with that given in equations II.5 and II.6 of that report. Also in equation III.31 B_m^3 should be $(B_m a)^3$ and B_m should be $B_m a$]. In this report $B_m a$ is replaced by B_m^* thus removing the physical significance to this parameter and making it empirical.

II. Results

The results are given in tables 1 to 32, inclusive. In each case the values are those calculated by the above equations and represent the best fit to the experimental data.

III. References

(For data at 25 °C only)

NaF

1. R. W. Ivett and T. DeVries, J. Am. Chem. Soc. 63, 2821 (1941).

   Emf: NaHg|NaF(m)|PbF_2, PbHg

   m = 0.05 - 0.9 m (saturated at 0.983 m)

2. R. A. Robinson, J. Am. Chem. Soc. 63, 628 (1941).

   Isopiestic vapor pressure: m = 0.1 - 4.0: ϕ and γ

KF

3. R. A. Robinson, J. Am. Chem. Soc. 63, 628 (1941).

   Isopiestic vapor pressure: m = 0.1 - 4.0: ϕ and γ

4. J. Tamas and G. Kosza, Magy. Kem. Folyoirat. 70, 148 (1964).

   Isopiestic vapor pressure: m = 2.0 - 17.5: ϕ and γ

RbF

5. H. Ti Tien, J. Phys. Chem. 67, 532 (1963).

   Isopiestic vapor pressure: m = 0.1 - 3.5: γ and ϕ

CsF

6. H. Ti Tien, J. Phys. Chem. 67, 532 (1963).

   Isopiestic vapor pressure: m = 0.1 - 3.5: ϕ and γ

$\underline{NaClO_3}$

7. J. H. Jones, J. Am. Chem. Soc. 65, 1353 (1943).

   Isopiestic vapor pressure: m = 0.2 - 3.0: ϕ and γ

$\underline{KClO_3}$

8. J. H. Jones and H. R. Froning, J. Am. Chem. Soc. 66, 1673 (1944).

   Isotonic solutions: m = 0.2 - 0.7: ϕ and γ

$\underline{NaBrO_3}$

9. J. H. Jones and H. R. Froning, J. Am. Chem. Soc. 66, 1673 (1944).

   Isotonic solutions: m = 0.2 - 2.617 (saturated): ϕ and γ

$\underline{KBrO_3}$

10. J. H. Jones, J. Am. Chem. Soc. 69, 2066 (1947).

   Isotonic solutions: m = 0.15 - 0.50: γ and ϕ

$\underline{HClO_4}$

11. A. K. Covington and J. E. Prue, J. Chem. Soc. 1567 (1957).

   Emf: $H_2|HClO_4||HClO_4|H_2$

   m = 0.01 - 0.10: γ

12. J. N. Pearce and A. F. Nelson, J. Am. Chem. Soc. 55, 3080 (1933).

   Vapor pressure: m = 0.0 → 12.0: γ

13. R. A. Robinson and O. J. Baker, Trans. & Proc. Royal Soc. N. Z., 76, 250 (1946).

   Isopiestic vapor pressure: m = 0.1 - 16: ϕ, ℓog, γ

14. R. Haase, K. H. Ducker and H. A. Kuppers, Ber. Bun. Physik. Chem. 69, 97 (1965).

   Isopiestic vapor pressure: m = 0.1 - 16.0: γ, ϕ

$\underline{LiClO_4}$

15. J. H. Jones, J. Phys. Chem. <u>51</u>, 516 (1947).

    Isopiestic vapor pressure: m = 0.2 - 4.5: ϕ and γ

16. H. S. Harned and J. A. Shropshire, J. Am. Chem. Soc. <u>80</u>, 2968 (1958).

    γ calculated from diffusion coefficient data. Concentration in moles/liter c = 0.0005 - 0.020: γ

$\underline{NaClO_4}$

17. J. H. Jones, J. Phys. Chem. <u>51</u>, 516 (1947).

    Isopiestic vapor pressure: m = 0.2 - 6.5: γ, ϕ

18. M. L. Miller and C. L. Sheridan, J. Phys. Chem. <u>60</u>, 185 (1956).

    [Note: t = 25 ± 1.0 °C] Isopiestic vapor pressure: m = 4 - 16: γ and (1 - ϕ) ["Salt dried to constant weight in oven at 110 °C. No further purification attempted."]

19. R. M. Rush and J. S. Johnson, J. Phys. Chem. <u>72</u> (3), 767 (1968).

    Isopiestic vapor pressure: m = 6 - 16 (even concentrations): ϕ and γ

$\underline{TlClO_4}$

20. R. A. Robinson, J. Am. Chem. Soc. <u>59</u>, 85 (1937).

    Isopiestic vapor pressure: m = 0.025 - 0.5: γ

<u>LiOH</u>

21. H. S. Harned and F. E. Swindells, J. Am. Chem. Soc. <u>48</u>, 128 (1926).

    Emf: $H_2|LiOH(m_2)|Li_x\,Hg|LiOH(m_1)|H_2$

    m = 0.0505 - 3.926: γ

22. W. Kangro and A. Groenveld, Z. Physik. Chem. (F), <u>32</u>, 110 (1926).

    Vapor pressure measurements: m = 0.5 - 5.0 (γ)

    m = 1.0 - 5.0 (ϕ)

NaOH

23. H. S. Harned, J. Am. Chem. Soc. 47, 676 (1925).

Emf: $H_2|NaOH(m_2)|Na_xHg|NaOH(m_1)|H_2$

m = 0.0202 - 3.10: γ

24. H. S. Harned, Z. Physik. Chem. 117, 1 (1925).

Emf: $H_2|NaOH(C_2)|Na_xHg|NaOH(C_1)|H_2$

m = 0.0202 - 3.10: γ

25. A. L. Ferguson and A. W. Schlucter, Trans. Am. Electrochem. Soc. 52, 369 (1927).

Emf: $H_2|NaOH(C_1)|Na_xHg|NaOH(C_2)|H_2$

m = 0.01004 - 2.825: γ

26. H. S. Harned and J. C. Hecker, J. Am. Chem. Soc. 55, 4841 (1933).

Emf: $H_2|NaOH(m)|Na_xHg|NaOH\ (0.05)|H_2$

m = 0.05 - 4.0: γ

27. Y. Kobayshi and Hsin-ying Wang, J. Sci. Hiroshima Univ. 5A, 71 (1934).

Emf: $Hg|HgO,\ NaOH(m)|H_2(Pt)$

m = 0.1 - 0.9

Activity of water in $NaOH$-H_2O solution calculated.

28. R. H. Stokes, J. Am. Chem. Soc. 67, 1690 (1945).

Isopiestic vapor pressure: m = 2.0 - 29.0: ϕ and γ

29. R. H. Stokes, J. Am. Chem. Soc. 69, 1291 (1947).

Vapor pressure: m = 5.085 - 13.834 water activities

30. W. Kangro and A. Groenveld, Z. Physik. Chem. (F) 32, 110 (1962).

Vapor pressure: m = 1.0 - 27.0: ϕ

KOH

31. M. Chow, J. Am. Chem. Soc. 43, 488 (1920).

Emf: Hg + H_2O, KOH(C_1), K in Hg, KOH(C_2), HgO + Hg

m = 0.003 - 1.00: γ

[Note: See M. Knobel, J. Am. Chem. Soc. 45, 70 (1923) for a revision of this work. Chow did not exclude air from his solutions.]

32. M. Knobel, J. Am. Chem. Soc. 45, 70 (1923).

Emf: $H_2|KOH(C_1)|KHg_x|KHg_x|KOH(C_2)|H_2$

m = 0.001 - 3.0: γ

33. H. S. Harned, Z. Physik. Chem. (L) 117, 1 (1925).

Emf: $H_2|KOH(C_1), KCl(C)|K_xHg|KOH(C_1)|H_2$

m = 0.03 - 3.0: γ

34. H. S. Harned and M. A. Cook, J. Am. Chem. Soc. 59, 497, 498 (1937).

Emf: $H_2|KOH(aq.,M)|K_xHg|KOH(aq.\ M = 0.05)|H_2$

m = 0.05 - 4.0: γ

35. W. Kangro and A. Groenveld, Z. Physik. Chem. (F) 32, 110 (1962).

Vapor pressure: m = 1.0 - 20.0: γ, ϕ

CsOH

36. H. S. Harned and O. E. Schupp, Jr., J. Am. Chem. Soc. 52, 3890, 91 (1930).

Emf: $H_2|CsOH(m)|Cs_xHg|CsOH(0.05)|H_2$

m = 0.01016 - 1.3205: γ

$\underline{HNO}_3$

37. H. J. Stonehill, J. Chem. Soc. (no vol. no.) 647 (1943).

Emf: Pt|Q(sat), HNO_3(m', fixed)|HNO_3(m, variable), Q(sat)|Pt

Q = quinhydrone

c = 0.001021 - 0.2040: $-\ell og\ \gamma$

38. A. K. Covington and J. E. Prue, J. Chem. Soc. (no vol. no.) 1567 (1957).

Emf: Glass electrode|$HNO_3(m_1)$|$HNO_3(m_2)$|glass electrode

m = 0.01 - 0.10: γ

39. R. Flatt and F. Benguerel, Helv. Chim. Acta. 45, 1765 (1962).

Liquid vapor equilibrium measured for binary system HNO_3-H_2O for compns. of liquid phase from 0 to 68% HNO_3.

40. W. Davis, Jr. and H. J. DeBruin, J. Inorg. & Nuc. Chem. 26, 1069 (1964).

Combines new transpiration data on partial pressures of HNO_3

c = 2 - 16 m/ℓ: γ

41. R. Haase, K. H. Duecker and H. A. Kueppers, Ber. Bunsenges, Physik. Chem. 69, 97 (1965).

Isopiestic vapor pressure: m = 2.0 - 28.0: γ and ϕ

$\underline{LiNO}_3$

42. J. N. Pearce and A. F. Nelson, J. Am. Chem. Soc. 54, 3545 (1932).

Vapor pressure measurements: m = 0.00 - 12.8693: γ

43. R. A. Robinson, J. Am. Chem. Soc. 57, 1167 (1935).

Isopiestic vapor pressure: m = 0.1 - 3.5: γ

44. R. A. Robinson, J. Am. Chem. Soc. 68, 2403 (1946).

Isopiestic vapor pressure: m = 0.1 - 13.5: ϕ and γ

$\underline{LiNO_3}$ (continued)

45. H. S. Harned and J. A. Shropshire, J. Am. Chem. Soc. 80, 2967 (1958).

    Diffusion coefficients: c = 0.0005 - .020: γ

46. W. Kangro and A. Groenveld, Z. Physik. Chem. (F) 32, 110 (1962).

    Vapor pressure: m = 1.0 - 20.0 (ϕ)

    m = 0.5 - 5.0 (γ)

$\underline{NaNO_3}$

47. R. A. Robinson, J. Am. Chem. Soc. 57, 1167 (1935).

    Isopiestic vapor pressure: m = 0.1 - 6.0: γ

48. J. N. Pearce and H. Hopson, J. Phys. Chem. 41, 536 (1937).

    Vapor pressure: Activity of H_2O and apparent and partial molal volumes of the salts in these solutions were calculated.

    m = 0.1 - 10.830 (saturated)

49. H. S. Harned and J. A. Shropshire, J. Am. Chem. Soc. 80, 2618 (1958).

    γ calculated from diffusion coefficient data

    c = 0.005 - 0.020

50. H. S. Harned and J. A. Shropshire, J. Am. Chem. Soc. 80, 2968 (1958).

    γ calculated from diffusion coefficient data

    c = 0.003 - 0.015

51. W. Kangro and A. Groenveld, Z. Phys. Chem. 32, 110 (1962).

    Vapor pressure: m = 0.1 - 10.0: ϕ

$\underline{KNO_3}$

52. R. A. Robinson, J. Am. Chem. Soc. 57, 1167 (1935).

    Isopiestic vapor pressure: m = 0.1 - 3.5: γ

KNO_3 (continued)

53. H. S. Harned and R. M. Hudson, J. Am. Chem. Soc. 73, 652 (1951).

    Differential diffusion coefficients: c = 0.00 - 0.00919

54. H. S. Harned and J. A. Shropshire, J. Am. Chem. Soc. 80, 2968 (1958).

    Diffusion coefficient data

    c = 0.0005 - 0.020: γ

55. W. Kangro and A. Groenveld, Z. Physik. Chem. 32, 110 (1962).

    Vapor pressure: m = 1.0 - 3.0: ϕ

$RbNO_3$

56. R. A. Robinson, J. Am. Chem. Soc. 59, 86 (1937).

    Isopiestic vapor pressure: m = 0.1 - 4.5: γ and ϕ

$CsNO_3$

57. R. A. Robinson, J. Am. Chem. Soc. 59, 86 (1937).

    Isopiestic vapor pressure: m = 0.1 - 1.5: γ and ϕ

$AgNO_3$

58. D. A. MacInnes and A. S. Brown, Chem. Rev. 18, 335 (1936).

    Emf: $Ag|AgNO_3(C_1)||AgNO_3(C_2)|Ag$

    C = 0.002 - 0.10: γ

59. R. A. Robinson and D. A. Tait, Trans. Faraday 37, 570 (1941).

    Isopiestic vapor pressure: m = 0.1 - 13.5: ϕ and γ

$AgNO_3$ (continued)

60. H. S. Harned and C. L. Hildreth, Jr., J. Am. Chem. Soc. 73, 3292 (1951).

    Conductometric method: c = 0.00 - 0.00628: Diffusion coefficients

61. W. Kangro and A. Groenveld, Z. Physik. Chem. (F) 32, 110 (1962).

    Vapor pressure: m = 1.0 - 14.0: ϕ

NH_4Cl

62. J. N. Pearce and G. G. Pumplin, J. Am. Chem. Soc. 59, 1219 (1937).

    Vapor pressure: m = 0.1 - 7.38 (saturated): γ

63. B. F. Wishaw and R. H. Stokes, Trans. Faraday 49, 27 (1953).

    Isopiestic vapor pressure: m = 0.1 - 7.390 (saturated): γ and ϕ

64. M. M. Shul'ts, L. L. Makarov and SuYu-jêng, Russ. J. Phys. Chem. 36, 1181 (1962).

    Isopiestic vapor pressure: m = 5.0 - 7.42: ϕ and γ

NH_4NO_3

65. B. F. Wishaw and R. H. Stokes, Trans. Faraday 49, 30 (1953).

    Isopiestic vapor pressure: m = 0.1 - 25.954 (saturated): γ and ϕ

NH_4ClO_4

66. O. E. Esval and S. Y. Tyree, Jr., J. Phys. Chem. 66, 940 (1962).

    Isopiestic vapor pressure: m = 0.1 - 2.1: ϕ and γ

NaCNS

67. R. A. Robinson, J. Am. Chem. Soc. 62, 3131 (1940).

    Isopiestic vapor pressure: m = 0.1 - 4.0: ϕ and γ

NaCNS (continued)

68. M. L. Miller and C. L. Sheridan, J. Phys. Chem. 60, 185 (1956).

Note: $t = 25 \pm 1.0$ °C

Isopiestic vapor pressure: m = 1.0 - 18.0: γ; $(1-\phi)$

Salt used without purification

KCNS

69. J. N. Pearce and H. Hopson, J. Phys. Chem. 41, 536 (1937).

Vapor pressure: m = 0.00 - 10.0

70. R. A. Robinson, J. Am. Chem. Soc. 62, 3131-2 (1940).

Isopiestic vapor pressure: m = 0.1 - 5.0: ϕ and γ

NaH_2PO_4

71. J. M. Stokes, Trans. Faraday 41, 686 (1945).

Isopiestic vapor pressure: m = 0.1 - 6.5: ϕ and γ

72. G. Scatchard and R. C. Breckenridge, J. Phys. Chem. 58, 596 (1954).

Isopiestic vapor pressure: m = 0.1 - 1.3: $1 + \log \gamma$

KH_2PO_4

73. J. M. Stokes, Trans. Faraday 41, 685 (1945).

Isopiestic vapor pressure: m = 0.1 - 1.8: ϕ and γ

74. G. Scatchard and R. C. Breckenridge, J. Phys. Chem. 58, 596 (1954).

Isopiestic vapor pressure: m = 0.1 - 1.3: ϕ

NaH_2AsO_4

75. G. Scatchard and R. C. Breckenridge, J. Phys. Chem. 58, 596 (1954).

Isopiestic vapor pressure: m = 0.1 - 1.3: ϕ

$\underline{KH_2AsO_4}$

76. G. Scatchard and R. C. Breckinridge, J. Phys. Chem. 58, 599 (1954).

Isopiestic vapor pressure: m = 0.1 - 1.3: ϕ

TABLE 1 - Osmotic coefficients and mean activity coefficients of NaF at 25 °C.

[Based on data in references 1,2]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.30	0.898	0.676
.002	.984	.951	.40	.892	.651
.005	.976	.926	.50	.887	.632
.01	.967	.901	.60	.884	.617
.02	.956	.868	.70	.881	.604
.05	.939	.813	.80	.878	.593
.10	.924	.764	.90	.877	.584
.20	.908	.709	1.0	.875	.575

$B^*_m = 1.30$

$\beta = -0.0252$

$s_\phi = 0.0019$

$s_\gamma = 0.0013$

TABLE 2 - Osmotic coefficients and mean activity coefficients of KF at 25 °C

[Based on data in references 3,4]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.90	0.928	0.647	5.5	1.24	0.928
.002	.984	.952	1.0	.932	.645	6.0	1.28	.990
.005	.976	.927	1.2	.940	.643	7.0	1.37	1.13
.01	.968	.902	1.4	.950	.644	8.0	1.45	1.30
.02	.958	.870	1.6	.961	.647	9.0	1.53	1.49
.05	.942	.818	1.8	.972	.651	10.0	1.61	1.71
.10	.930	.773	2.0	.983	.657	11.0	1.68	1.96
.20	.920	.726	2.5	1.014	.678	12.0	1.75	2.23
.30	.916	.700	3.0	1.048	.705	13.0	1.81	2.52
.40	.915	.683	3.5	1.084	.738	14.0	1.86	2.81
.50	.916	.671	4.0	1.121	.777	15.0	1.90	3.12
.60	.918	.662	4.5	1.160	.822	16.0	1.93	3.41
.70	.921	.655	5.0	1.201	.872	17.0	1.95	3.69
.80	.924	.651						

$B^*_m = 1.30$

$\beta = 0.0266$

$C = 0.00532$

$D = -0.000286$

$E = 0.00000376$

$s_\phi = 0.0035$

$s_\gamma = 0.0079$

TABLE 3 - Osmotic coefficients and mean activity coefficients of RbF at 25 °C

[Based on data in reference 5]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.70	0.939	0.675
.002	.984	.951	.80	.945	.674
.005	.976	.926	.90	.951	.674
.01	.967	.901	1.0	.958	.675
.02	.957	.869	1.2	.970	.679
.05	.942	.817	1.4	.982	.684
.10	.930	.773	1.6	.994	.692
.20	.923	.728	1.8	1.005	.700
.30	.922	.706	2.0	1.016	.708
.40	.925	.692	2.5	1.040	.731
.50	.929	.683	3.0	1.061	.752
.60	.934	.678	3.5	1.076	.773

$B_m^* = 1.10$

$\beta = 0.0789$

$C = -0.00615$

$s_\phi = 0.00815$

$s_\gamma = 0.00590$

TABLE 4 - Osmotic coefficients and mean activity coefficients of CsF at 25 °C

[Based on data in reference 6]

m	ϕ	γ	m	ϕ	γ
.001	.988	.965	0.70	.959	.704
.002	.984	.952	.8	.967	.706
.005	.976	.927	.9	.976	.710
.01	.968	.902	1.0	.985	.715
.02	.958	.870	1.2	1.003	.727
.05	.944	.820	1.4	1.021	.742
.1	.934	.779	1.6	1.040	.758
.2	.929	.739	1.8	1.058	.777
.3	.931	.720	2.0	1.075	.796
.4	.936	.709	2.5	1.118	.850
.5	.943	.705	3.0	1.159	.908
.6	.951	.703	3.5	1.197	.970

$B_m^* = 1.164$

$\beta = 0.0938$

$s_\phi = 0.0098$

$s_\gamma = 0.0068$

TABLE 5 - Osmotic coefficients and mean activity coefficients of $NaClO_3$ at 25 °C

[Based on data in reference 7]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.80	0.889	0.610
.002	.984	.952	.90	.888	.601
.005	.976	.927	1.0	.887	.594
.01	.968	.902	1.2	.886	.581
.02	.957	.870	1.4	.886	.571
.05	.941	.817	1.6	.886	.562
.10	.927	.769	1.8	.886	.554
.20	.913	.717	2.0	.886	.548
.30	.905	.686	2.5	.887	.535
.40	.900	.663	3.0	.886	.524
.50	.896	.646	3.5	.885	.514
.60	.893	.632	4.0	.882	.504
.70	.891	.620			

$B_m^* = 1.40$

$\beta = -0.0209$

$C = 0.00950$

$s_\phi = 0.00819$

$s_\gamma = 0.00546$

TABLE 6 - Osmotic coefficients and mean activity coefficients of $KClO_3$ at 25 °C

[Based on data in reference 8]

m	ϕ	γ
0.001	0.988	0.965
.002	.984	.951
.005	.975	.926
.01	.966	.899
.02	.955	.865
.05	.934	.806
.10	.914	.749
.20	.886	.680
.30	.865	.634
.40	.848	.598
.50	.833	.568
.60	.820	.543
.70	.808	.522

$B_m^* = 1.50$

$\beta = -0.162$

$s_\phi = .00310$

$s_\gamma = .00198$

TABLE 7 - Osmotic coefficients and mean activity coefficients of $NaBrO_3$ at 25 °C

[Based on data in reference 9]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.60	0.855	0.584
.002	.984	.951	.70	.848	.567
.005	.976	.926	.80	.843	.552
.01	.967	.901	.90	.838	.539
.02	.956	.868	1.0	.833	.528
.05	.938	.811	1.2	.826	.508
.10	.920	.759	1.4	.820	.491
.20	.898	.698	1.6	.813	.476
.30	.884	.658	1.8	.807	.463
.40	.872	.628	2.0	.799	.450
.50	.863	.604	2.5	.768	.416

$B_m^* = 1.50$

$\beta = -0.106$

$C = 0.0414$

$s_\phi = 0.00680$

$s_\gamma = 0.00315$

TABLE 8 - Osmotic coefficients and mean activity coefficients of $KBrO_3$ at 25 °C

[Based on data in reference 10]

m	ϕ	γ
0.001	0.988	0.964
.002	.983	.951
.005	.974	.925
.01	.965	.898
.02	.953	.863
.05	.932	.802
.10	.910	.744
.20	.881	.672
.30	.857	.623
.40	.836	.584
.50	.817	.550

$B_m^* = 1.30$

$s_\phi = .00076$

$s_\gamma = .00327$

TABLE 9 - Osmotic coefficients and mean activity coefficients of $HClO_4$ at 25 °C

[Based on data in references 11-14]

m	ϕ	γ	m	ϕ	γ
0.001	0.989	0.966	2.0	1.209	1.055
.002	.985	.953	2.5	1.303	1.226
.005	.977	.929	3.0	1.403	1.445
.01	.970	.906	3.5	1.509	1.724
.02	.962	.878	4.0	1.621	2.078
.05	.952	.836	4.5	1.737	2.527
.10	.947	.803	5.0	1.857	3.098
.20	.949	.775	5.5	1.98	3.83
.30	.957	.766	6.0	2.11	4.75
.40	.967	.765	7.0	2.37	7.45
.50	.978	.769	8.0	2.63	11.86
.60	.990	.776	9.0	2.90	19.07
.70	1.003	.786	10.0	3.17	30.8
.80	1.016	.798	11.0	3.43	49.9
.90	1.030	.811	12.0	3.68	80.6
1.0	1.045	.826	13.0	3.93	129.
1.2	1.075	.861	14.0	4.17	205.
1.4	1.106	.901	15.0	4.39	322.
1.6	1.139	.947	16.0	4.60	498.
1.8	1.174	.998			

$B_m^* = 1.70$ $E = 0.00000728$

$\beta = 0.0938$ $s_\phi = 0.00263$

$C = 0.0131$ $s_\gamma = 0.475$

$D = -0.000580$

TABLE 10 - Osmotic coefficients and mean activity coefficients of $LiClO_4$ at 25 °C

[Based on data in references 15,16]

m	ϕ	γ	m	ϕ	γ
0.001	0.989	0.966	0.80	1.041	0.850
.002	.985	.953	.90	1.057	.868
.005	.978	.931	1.0	1.072	.888
.01	.971	.908	1.2	1.104	.932
.02	.964	.882	1.4	1.137	.981
.05	.956	.843	1.6	1.171	1.035
.10	.953	.815	1.8	1.205	1.095
.20	.960	.795	2.0	1.239	1.160
.30	.971	.792	2.5	1.327	1.349
.40	.983	.797	3.0	1.417	1.580
.50	.997	.806	3.5	1.509	1.859
.60	1.011	.818	4.0	1.601	2.195
.70	1.026	.833			

$B^*_m = 1.90$

$\beta = 0.117$

$C = 0.00753$

$D = -0.000594$

$s_\phi = 0.00219$

$s_\gamma = 0.00452$

TABLE 11 - Osmotic coefficients and mean activity coefficients of $NaClO_4$ at 25 °C

[Based on data in references 17-19]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.0	0.913	0.630
.002	.984	.952	1.2	.916	.622
.005	.976	.928	1.4	.920	.616
.01	.968	.903	1.6	.924	.612
.02	.959	.872	1.8	.929	.610
.05	.943	.821	2.0	.934	.608
.10	.931	.777	2.5	.947	.608
.20	.920	.729	3.0	.961	.612
.30	.915	.702	3.5	.976	.618
.40	.912	.683	4.0	.991	.626
.50	.911	.668	4.5	1.007	.636
.60	.910	.657	5.0	1.024	.648
.70	.910	.648	5.5	1.042	.662
.80	.911	.641	6.0	1.063	.679
.90	.912	.635			

$B_m^* = 1.50$

$\beta = -0.00300$

$C = 0.00748$

$D = -0.00120$

$E = 0.0000826$

$s_\phi = 0.00116$

$s_\gamma = 0.00098$

TABLE 12 - Osmotic coefficients and mean activity coefficients of $TlClO_4$ at 25 °C

[Based on data in references 20]

m	ϕ	γ
0.001	0.988	0.964
.002	.983	.950
.005	.974	.923
.01	.964	.895
.02	.950	.857
.05	.926	.791
.10	.900	.727
.20	.867	.650
.30	.843	.598
.40	.822	.558
.50	.804	.526

$$B_m^* = 0.825$$

$$s_\phi = .00113$$

$$s_\gamma = .0026$$

TABLE 13 - Osmotic coefficients and mean activity coefficients of LiOH at 25 °C

[Based on data in references 21,22]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.80	0.861	0.540
.002	.983	.950	.90	.863	.532
.005	.974	.924	1.0	.866	.526
.01	.964	.895	1.2	.871	.517
.02	.951	.859	1.4	.875	.508
.05	.928	.794	1.6	.876	.501
.10	.906	.734	1.8	.876	.493
.20	.881	.665	2.0	.874	.486
.30	.868	.624	2.5	.869	.470
.40	.861	.596	3.0	.871	.460
.50	.858	.576	3.5	.884	.457
.60	.858	.560	4.0	.884	.450
.70	.859	.549			

$B_m^* = 0.800$
$\beta = -0.0694$
$C = 0.138$
$D = -0.0831$
$E = 0.0210$
$F = -0.00191$
$s_\phi = 0.0934$
$s_\gamma = 0.0354$

TABLE 14 - Osmotic coefficients and mean activity coefficients of NaOH at 25 °C

[Based on data in references 23-30]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.6	0.991	0.690	13.0	2.38	6.51
.002	.984	.952	1.8	1.005	.700	14.0	2.48	8.03
.005	.976	.927	2.0	1.020	.711	15.0	2.57	9.74
.01	.968	.902	2.5	1.060	.747	16.0	2.64	11.6
.02	.958	.871	3.0	1.103	.792	17.0	2.70	13.6
.05	.943	.820	3.5	1.151	.846	18.0	2.74	15.6
.10	.932	.777	4.0	1.202	.912	19.0	2.77	17.6
.20	.924	.733	4.5	1.256	.989	20.0	2.78	19.6
.30	.923	.710	5.0	1.314	1.079	21.0	2.78	21.4
.40	.925	.696	5.5	1.38	1.19	22.0	2.78	23.1
.50	.927	.686	6.0	1.44	1.31	23.0	2.77	24.8
.60	.931	.680	7.0	1.57	1.62	24.0	2.75	26.4
.70	.936	.676	8.0	1.71	2.03	25.0	2.74	28.0
.80	.941	.674	9.0	1.86	2.56	26.0	2.73	29.7
.90	.946	.673	10.0	2.00	3.25	27.0	2.73	31.5
1.0	.952	.673	11.0	2.13	4.13	28.0	2.72	33.5
1.2	.964	.676	12.0	2.26	5.21	29.0	2.72	35.5
1.4	.977	.682						

$B_m^* = 1.30$

$\beta = -0.0484$

$C = 0.00125$

$D = 0.000714$

$E = -0.0000687$

$F = 0.00000216$

$G = -0.0000000230$

$s_\phi = 0.0164$

$s_\gamma = 0.527$

TABLE 15 - Osmotic coefficients and mean activity coefficients of KOH at 25 °C

[Based on data in references 31-35]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.0	0.999	0.733	7.0	1.82	2.82
.002	.984	.952	1.2	1.021	.751	8.0	1.96	3.66
.005	.976	.927	1.4	1.045	.773	9.0	2.10	4.73
.01	.968	.902	1.6	1.069	.798	10.0	2.23	6.10
.02	.958	.871	1.8	1.094	.826	11.0	2.35	7.83
.05	.944	.822	2.0	1.120	.857	12.0	2.47	9.97
.10	.935	.780	2.5	1.185	.947	13.0	2.58	12.6
.20	.931	.742	3.0	1.252	1.053	14.0	2.69	15.8
.30	.934	.724	3.5	1.321	1.18	15.0	2.78	19.5
.40	.940	.715	4.0	1.391	1.33	16.0	2.86	23.8
.50	.948	.712	4.5	1.462	1.50	17.0	2.94	28.8
.60	.957	.712	5.0	1.533	1.69	18.0	3.00	34.4
.70	.967	.714	5.5	1.60	1.92	19.0	3.06	40.5
.80	.977	.719	6.0	1.68	2.18	20.0	3.10	47.2
.90	.988	.725						

$B_m^* = 1.20$

$\beta = 0.0933$

$C = 0.00405$

$D = -0.000250$

$E = 0.00000342$

$s_\phi = 0.0107$

$s_\gamma = 0.257$

TABLE 16 - Osmotic coefficients and mean activity coefficients of CsOH at 25 °C

[Based on data in reference 36]

m	ϕ	γ	m	ϕ	γ
.001	.988	.965	.4	.955	.744
.002	.984	.952	.5	.964	.744
.005	.976	.928	.6	.974	.747
.01	.969	.904	.7	.984	.752
.02	.960	.875	.8	.995	.759
.05	.948	.830	.9	1.005	.767
.1	.942	.793	1.0	1.016	.777
.2	.941	.761	1.2	1.039	.798
.3	.947	.748			

$B^*_m = 1.47$

$\beta = 0.0969$

$s_\gamma = .00658$

TABLE 17 - Osmotic coefficients and mean activity coefficients of HNO_3 at 25 °C

[Based on data in references 37-41]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.989	0.965	1.4	1.008	0.744	12.0	1.49	1.89
.002	.984	.952	1.6	1.023	.757	13.0	1.51	2.00
.005	.977	.928	1.8	1.037	.770	14.0	1.53	2.11
.01	.969	.904	2.0	1.050	.784	15.0	1.54	2.22
.02	.960	.874	2.5	1.084	.824	16.0	1.54	2.32
.05	.947	.828	3.0	1.117	.867	17.0	1.55	2.41
.10	.939	.789	3.5	1.148	.913	18.0	1.55	2.49
.20	.936	.753	4.0	1.178	.961	19.0	1.55	2.55
.30	.938	.735	4.5	1.207	1.011	20.0	1.54	2.61
.40	.942	.725	5.0	1.234	1.064	21.0	1.54	2.66
.50	.947	.720	5.5	1.26	1.12	22.0	1.52	2.70
.60	.954	.718	6.0	1.29	1.17	23.0	1.51	2.73
.70	.960	.718	7.0	1.33	1.29	24.0	1.50	2.74
.80	.967	.719	8.0	1.37	1.41	25.0	1.48	2.75
.90	.974	.722	9.0	1.41	1.53	26.0	1.46	2.74
1.0	.981	.725	10.0	1.44	1.65	27.0	1.43	2.72
1.2	.995	.734	11.0	1.47	1.77	28.0	1.41	2.70

$B_m^* = 1.50$
$\beta = 0.0665$
$C = -0.00180$
$D = 0.0000127$
$s_\phi = 0.0142$
$s_\gamma = 0.0324$

TABLE 18 - Osmotic coefficients and mean activity coefficients of $LiNO_3$ at 25 °C

[Based on data in references 42-46]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.0	0.997	0.743	7.0	1.49	1.72
.002	.984	.952	1.2	1.014	.758	8.0	1.55	1.96
.005	.976	.928	1.4	1.033	.775	9.0	1.61	2.22
.01	.969	.904	1.6	1.052	.794	10.0	1.66	2.50
.02	.960	.874	1.8	1.070	.815	11.0	1.70	2.79
.05	.947	.827	2.0	1.089	.837	12.0	1.74	3.08
.10	.939	.789	2.5	1.134	.898	13.0	1.77	3.38
.20	.936	.753	3.0	1.178	.966	14.0	1.80	3.68
.30	.940	.736	3.5	1.222	1.039	15.0	1.81	3.96
.40	.946	.729	4.0	1.263	1.119	16.0	1.82	4.22
.50	.953	.726	4.5	1.304	1.205	17.0	1.83	4.46
.60	.961	.726	5.0	1.34	1.30	18.0	1.83	4.67
.70	.970	.728	5.5	1.38	1.39	19.0	1.82	4.84
.80	.978	.732	6.0	1.42	1.50	20.0	1.81	4.97
.90	.987	.737						

B^*_m = 1.40

β = 0.0854

C = -0.00138

D = -0.0000216

E = 0.000000191

s_ϕ = 0.0180

s_γ = 0.0625

TABLE 19 - Osmotic coefficients and mean activity coefficients of $NaNO_3$ at 25 °C

[Based on data in references 47-51]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.60	0.869	0.600	3.0	0.810	0.437
.002	.984	.951	.70	.864	.585	3.5	.803	.421
.005	.975	.926	.80	.860	.571	4.0	.797	.408
.01	.967	.900	.90	.855	.559	4.5	.792	.396
.02	.956	.867	1.0	.852	.549	5.0	.788	.386
.05	.938	.811	1.2	.845	.530	5.5	.787	.378
.10	.921	.760	1.4	.839	.514	6.0	.788	.371
.20	.903	.702	1.6	.834	.501	7.0	.807	.366
.30	.891	.666	1.8	.830	.489	8.0	.858	.377
.40	.883	.639	2.0	.826	.478	9.0	.962	.414
.50	.875	.618	2.5	.817	.456	10.0	1.14	.497

$B_m^* = 1.30$

$\beta = -0.0465$

$C = 0.00940$

$D = -0.00151$

$E = 0.000105$

$s_\phi = 0.0817$

$s_\gamma = 0.0339$

TABLE 20 - Osmotic coefficients and mean activity coefficients of KNO_3 at 25 °C

[Based on data in references 52-55]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.70	0.791	0.498
.002	.983	.951	.80	.778	.477
.005	.975	.924	.90	.766	.459
.01	.965	.897	1.0	.754	.442
.02	.953	.861	1.2	.733	.413
.05	.930	.798	1.4	.714	.389
.10	.907	.737	1.6	.697	.367
.20	.877	.664	1.8	.681	.348
.30	.855	.615	2.0	.666	.332
.40	.836	.578	2.5	.636	.298
.50	.819	.547	3.0	.612	.271
.60	.804	.520	3.5	.595	.251

$B_m^* = 1.10$

$\beta = -0.126$

$C = 0.0165$

$s_\phi = 0.0058$

$s_\gamma = 0.0019$

TABLE 21 - Osmotic coefficients and mean activity coefficients of $RbNO_3$ at 25 °C

[Based on data in reference 56]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.80	0.769	0.466
.002	.983	.950	.90	.756	.447
.005	.974	.924	1.0	.744	.430
.01	.965	.896	1.2	.722	.401
.02	.952	.859	1.4	.702	.376
.05	.928	.795	1.6	.684	.354
.10	.904	.733	1.8	.667	.335
.20	.872	.657	2.0	.652	.319
.30	.849	.607	2.5	.619	.284
.40	.829	.568	3.0	.593	.258
.50	.812	.537	3.5	.572	.237
.60	.796	.510	4.0	.558	.220
.70	.782	.486	4.5	.549	.207

B^*_m = 1.00

β = -0.125

C = 0.0159

s_ϕ = 0.0100

s_γ = 0.0026

TABLE 22 - Osmotic coefficients and mean activity coefficients of $CsNO_3$ at 25 °C

[Based on data in reference 57]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.40	0.822	0.562
.002	.983	.951	.50	.803	.529
.005	.974	.924	.60	.786	.501
.01	.965	.897	.70	.771	.477
.02	.952	.860	.80	.758	.456
.05	.929	.796	.90	.745	.438
.10	.904	.733	1.0	.735	.421
.20	.870	.656	1.2	.717	.394
.30	.844	.603	1.4	.704	.372

$B_m^* = 1.20$

$\beta = -0.182$

$C = 0.0397$

$s_\phi = 0.0036$

$s_\gamma = 0.0016$

TABLE 23 - Osmotic coefficients and mean activity coefficients of $AgNO_3$ at 25 °C

[Based on data in references 58-61]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.70	0.783	0.486	4.0	0.521	0.210
.002	.983	.950	.80	.770	.465	4.5	.499	.194
.005	.974	.924	.90	.757	.447	5.0	.480	.180
.01	.964	.896	1.0	.746	.430	5.5	.464	.168
.02	.951	.859	1.2	.723	.401	6.0	.450	.158
.05	.928	.794	1.4	.703	.376	7.0	.427	.142
.10	.903	.731	1.6	.683	.354	8.0	.409	.129
.20	.872	.655	1.8	.665	.334	9.0	.394	.118
.30	.849	.605	2.0	.648	.317	10.0	.378	.109
.40	.829	.567	2.5	.609	.281	11.0	.360	.101
.50	.813	.536	3.0	.576	.252	12.0	.336	.093
.60	.797	.509	3.5	.547	.229	13.0	.304	.085

$B_m^* = 0.90$

$\beta = -0.105$

$C = 0.00755$

$D = -0.000250$

$s_\phi = 0.0118$

$s_\gamma = 0.00155$

TABLE 24 - Osmotic coefficients and mean activity coefficients of NH_4Cl at 25 °C

[Based on data in references 62-64]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.0	0.895	0.602
.002	.984	.952	1.2	.897	.591
.005	.976	.927	1.4	.899	.584
.01	.968	.902	1.6	.902	.578
.02	.957	.870	1.8	.905	.573
.05	.941	.817	2.0	.909	.569
.10	.927	.770	2.5	.919	.564
.20	.914	.718	3.0	.929	.562
.30	.906	.688	3.5	.937	.561
.40	.902	.666	4.0	.945	.561
.50	.899	.649	4.5	.951	.560
.60	.897	.636	5.0	.955	.560
.70	.896	.625	5.5	.960	.561
.80	.895	.616	6.0	.966	.562
.90	.895	.608	7.0	.989	.573

$B_m^* = 1.40$

$\beta = -0.0179$

$C = 0.0124$

$D = -0.00230$

$E = 0.000146$

$s_\phi = 0.00667$

$s_\gamma = 0.00387$

TABLE 25 - Osmotic coefficients and mean activity coefficients of NH_4NO_3 at 25 °C

[Based on data in reference 65]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	1.2	0.808	0.482	9.0	0.631	0.233
.002	.983	.951	1.4	.798	.463	10.0	.621	.221
.005	.975	.925	1.6	.789	.446	11.0	.610	.211
.01	.966	.898	1.8	.781	.431	12.0	.600	.202
.02	.954	.863	2.0	.773	.418	13.0	.591	.194
.05	.933	.802	2.5	.755	.389	14.0	.581	.186
.10	.913	.746	3.0	.739	.366	15.0	.572	.179
.20	.890	.681	3.5	.725	.346	16.0	.562	.173
.30	.875	.640	4.0	.712	.329	17.0	.553	.167
.40	.863	.609	4.5	.701	.314	18.0	.545	.161
.50	.853	.584	5.0	.690	.301	19.0	.538	.156
.60	.845	.564	5.5	.681	.290	20.0	.532	.151
.70	.838	.546	6.0	.672	.279	22.0	.528	.144
.80	.831	.530	7.0	.656	.261	24.0	.538	.140
.90	.824	.516	8.0	.643	.246	26.0	.569	.139
1.0	.819	.504						

$B_m^* = 1.00$

$\beta = -0.0450$

$C = 0.00286$

$D = -0.000124$

$E = 0.00000215$

$s_\phi = 0.0196$

$s_\gamma = 0.00313$

TABLE 26 - Osmotic coefficients and mean activity coefficients of NH_4ClO_4 at 25 °C

[Based on data in reference 66]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.60	0.823	0.537
.002	.983	.951	.70	.813	.517
.005	.974	.924	.80	.805	.500
.01	.965	.897	.90	.798	.485
.02	.953	.861	1.0	.792	.472
.05	.930	.798	1.2	.782	.449
.10	.908	.739	1.4	.776	.431
.20	.881	.668	1.6	.772	.417
.30	.861	.622	1.8	.772	.406
.40	.846	.587	2.0	.774	.397
.50	.834	.560			

$B^*_m = 1.00$

$\beta = -0.0905$

$C = 0.0190$

$s_\phi = .0131$

$s_\gamma = .00875$

TABLE 27 - Osmotic coefficients and mean activity coefficients of NaCNS at 25 °C

[Based on data in references 67,68]

m	ϕ	γ	m	ϕ	γ	m	ϕ	γ
0.001	0.989	0.965	0.90	0.962	0.708	6.0	1.34	1.21
.002	.984	.952	1.0	.968	.710	7.0	1.42	1.39
.005	.977	.928	1.2	.980	.715	8.0	1.49	1.59
.01	.969	.905	1.4	.993	.723	9.0	1.56	1.82
.02	.960	.875	1.6	1.005	.732	10.0	1.63	2.07
.05	.948	.828	1.8	1.018	.743	11.0	1.68	2.32
.10	.939	.789	2.0	1.032	.755	12.0	1.72	2.57
.20	.934	.752	2.5	1.066	.790	13.0	1.75	2.81
.30	.935	.732	3.0	1.102	.831	14.0	1.76	3.00
.40	.938	.721	3.5	1.140	.879	15.0	1.76	3.15
.50	.942	.714	4.0	1.178	.933	16.0	1.74	3.24
.60	.946	.710	4.5	1.217	.993	17.0	1.70	3.26
.70	.951	.708	5.0	1.256	1.059	18.0	1.65	3.22
.80	.957	.707	5.5	1.30	1.13			

$B_m^* = 1.60$

$\beta = 0.0458$

$C = 0.00176$

$D = 0.0000986$

$E = -0.0000198$

$s_\phi = 0.07$

$s_\gamma = 0.180$

TABLE 28 - Osmotic coefficients and mean activity coefficients of KCNS at 25 °C

[Based on data in references 69,70]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.90	0.893	0.606
.002	.984	.951	1.0	.893	.599
.005	.976	.927	1.2	.893	.587
.01	.967	.901	1.4	.893	.577
.02	.957	.869	1.6	.893	.569
.05	.940	.815	1.8	.894	.562
.10	.926	.768	2.0	.894	.556
.20	.913	.716	2.5	.895	.544
.30	.906	.685	3.0	.896	.534
.40	.901	.664	3.5	.896	.526
.50	.898	.647	4.0	.896	.518
.60	.896	.634	4.5	.896	.512
.70	.895	.623	5.0	.898	.508
.80	.894	.614			

$B_m^* = 1.30$

$\beta = -0.00291$

$C = 0.00302$

$s_\phi = 0.0105$

$s_\gamma = 0.00620$

TABLE 29 - Osmotic coefficients and mean activity coefficients of NaH_2PO_4 at 25 °C

[Based on data in references 71,72]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	1.0	0.778	0.469
.002	.984	.951	1.2	.762	.442
.005	.975	.925	1.4	.747	.420
.01	.966	.898	1.6	.735	.400
.02	.954	.864	1.8	.724	.384
.05	.933	.804	2.0	.715	.369
.10	.912	.746	2.5	.699	.340
.20	.885	.677	3.0	.690	.319
.30	.865	.631	3.5	.687	.303
.40	.848	.595	4.0	.689	.291
.50	.833	.566	4.5	.697	.283
.60	.820	.541	5.0	.710	.278
.70	.808	.520	5.5	.729	.276
.80	.798	.501	6.0	.753	.276
.90	.788	.484			

$B_m^* = 1.30$

$\beta = -0.130$

$C = 0.0260$

$s_\phi = 0.0137$

$s_\gamma = 0.00429$

TABLE 30 - Osmotic coefficients and mean activity coefficients of KH_2PO_4 at 25 °C

[Based on data in references 73,74]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.964	0.50	0.807	0.536
.002	.983	.951	.60	.790	.508
.005	.975	.925	.70	.774	.483
.01	.965	.897	.80	.759	.461
.02	.953	.862	.90	.745	.442
.05	.930	.798	1.0	.732	.424
.10	.906	.737	1.2	.707	.393
.20	.873	.661	1.4	.683	.366
.30	.848	.609	1.6	.660	.342
.40	.826	.569	1.8	.638	.321

$B_m^* = 1.30$

$\beta = -0.187$

$C = 0.0498$

$s_\phi = 0.00936$

$s_\gamma = 0.00629$

TABLE 31 - Osmotic coefficients and mean activity coefficients of NaH_2AsO_4 at 25 °C

[Based on data in reference 75]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.40	0.876	0.638
.002	.984	.952	.50	.864	.613
.005	.976	.927	.60	.853	.590
.01	.968	.902	.70	.842	.570
.02	.957	.870	.80	.831	.552
.05	.940	.816	.90	.820	.535
.10	.924	.766	1.0	.810	.519
.20	.904	.707	1.2	.788	.490
.30	.889	.668			

B^*_m = 1.60

β = -0.0849

s_ϕ = 0.00774

s_γ = 0.00416

TABLE 32 - Osmotic coefficients and mean activity coefficients of KH_2AsO_4 at 25 °C

[Based on data in reference 76]

m	ϕ	γ	m	ϕ	γ
0.001	0.988	0.965	0.40	0.849	0.601
.002	.984	.951	.50	.833	.571
.005	.975	.926	.60	.819	.545
.01	.966	.899	.70	.807	.523
.02	.955	.865	.80	.796	.504
.05	.935	.807	.90	.787	.487
.10	.915	.752	1.0	.772	.472
.20	.889	.684	1.2	.754	.442
.30	.867	.637			

$B^*_m = 1.30$

$\beta = -0.0854$

$s_\phi = 0.0276$

$s_\gamma = 0.00754$

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