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J. A. Rard, A. M. Wijesinghe, and T. J. Wolery

U.S. Department of Energy
Lawrence Livermore National Laboratory

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REPRESENTATION OF THE THERMODYNAMIC PROPERTIES OF $Mg(NO_3)_2(aq)$ USING THE STANDARD (PITZER) AND EXTENDED (ARCHER) ION-INTERACTION MODELS AT 298.15 K

Joseph A. Rard, Ananda M. Wijesinghe, and Thomas J. Wolery
Energy and Environment Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, California 94550-9234
U.S.A.

Published thermodynamic data yielding the osmotic coefficients (isopiestic and direct vapor pressure measurements), relative apparent molar enthalpies (enthalpies of dilution and of solution), and apparent molar heat capacities (flow and "batch" calorimetry) for $Mg(NO_3)_2(aq)$ have been compiled, recalculated consistently, and critically compared to assess their reliability. The more reliable of these data have been used to evaluate the parameters of the standard three-parameter form of Pitzer's ion-interaction model, along with the parameters of Archer's four-parameter, extended ion-interaction model, at 298.15 K. Available osmotic coefficients extend to 5.123 $mol \cdot kg^{-1}$, which is slightly above the molality for a saturated solution in contact with the thermodynamically stable solid phase $Mg(NO_3)_2 \cdot 6H_2O(s)$. However, the molality ranges for the available relative apparent molar enthalpies and apparent molar heat capacities are much more restricted. Published experimental thermodynamic data were represented essentially equally well by Pitzer's standard three-parameter model and Archer's four-parameter model, provided that the exponential coefficient α_1 of the standard Pitzer model is fixed at the optimum value of $\alpha_1 = 1.55\ kg^{1/2} \cdot mol^{-1/2}$, rather than the traditional value of $\alpha_1 = 2.0\ kg^{1/2} \cdot mol^{-1/2}$. Archer's model is capable of representing these osmotic coefficients accurately with this value of α_1 or any other value in the examined range of $\alpha_1 = 1.0$ to $2.0\ kg^{1/2} \cdot mol^{-1/2}$, provided the second exponential coefficient ω_1 is optimized. At each value of α_1, a plot of the standard deviation $\sigma(\phi$, Archer) against ω_1 exhibited two local minima along with an absolute minimum. The use of the standard Pitzer model with $\alpha_1 = 1.55\ kg^{1/2} \cdot mol^{-1/2}$ is recommended for $Mg(NO_3)_2(aq)$.

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University of California
Lawrence Livermore National Laboratory
Technical Information Department
Livermore, CA 94551