equation is recommended for diffusivity prediction in *n*-alkane-*n*-alkane systems, and the Mitchell et al. equation is recommended for diffusivity prediction in *n*-alkane-*n*-alcohol systems.

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Nomenclature

A_T = effective mass transfer per side of frit, cm^2
B = an experimental constant defined in Equation 8
C = solute concentration (activity) within the frit, g-mol/l. (cpm/ml)
C_f = solute concentration (activity) in the solvent bath, g-mol/l. (cpm/ml)
D = molecular diffusivity, cm^2/sec
k = Boltzmann constant, 1.380×10^{-16} erg/K
K_1, K_2 = solute-solvent parameters of Equation 11
L_{eff} = effective length of the diffusion path from the surface to the center of the frit, cm
M = molecular weight, g/g-mol
N = number of samples taken during the experimental run
N_A = Avogadro's number, 6.0248×10^{23} mol^{-1}
t = time, sec
V_f = volume of solvent in the solvent bath, cm^3
x = distance, cm

Greek Letters

μ = viscosity, cp

Subscripts

calcd = calculated from a prediction expression
exp = experimental quantity
i = sample index number

Superscripts

$^\circ$ = initial value

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Solubility of Zinc Iodate in Aqueous Solution at 20.2°, 28.4°, and 40.6°C

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The solubility of zinc iodate in aqueous solutions of varying ionic strengths adjusted by potassium nitrate was determined as a function of temperature by radiotracer techniques. The solubility product constants were 3.57×10^{-6}, 5.40×10^{-6}, and 7.39×10^{-6} at 20.2°, 28.4°, and 40.6°C, respectively. Mean ionic activity coefficients were also determined.

Few determinations of the solubility of $Zn(IO_3)_2$ are reported in the literature. Ricci and Nesse (*3*) gave the solubility of $Zn(IO_3)_2$ in aqueous solution at 25°C as 0.01548*M*. Saegusa (*4*) determined the solubility as a function of ionic strength at 25°C and found the solubility product constant to be 3.905×10^{-6}. Seidell and Linke (*5*) listed the solubility of $Zn(IO_3)_2$ in hot and cold water.

Radiotracer techniques employing a Zn^{65}-labeled precipitate of $Zn(IO_3)_2$ have been used to determine the solubility of $Zn(IO_3)_2$ as a function of ionic strength at 20.2°, 28.4°, and 40.6°C. The activity coefficients were determined through the Debye-Hückel relations, and the solubility product constants were found at each temperature.

Experimental

Zinc iodate was prepared by the method of Ricci and Nesse (*3*). Solutions of J. T. Baker AR potassium iodate and zinc nitrate were heated to boiling. The iodate solution was added slowly to the zinc nitrate solution with continuous stirring. The precipitate was allowed to digest and after filtration was dried over phosphorus pentoxide. The precipitate was dissolved, and the dilute solution titrated with a solution of arsenous oxide following the procedure of Vogel (*7*) and was 98.6% pure. The radioactive precipitate was prepared in the same fashion with tracer amounts of Zn^{65}, a gamma emitter of 1.11 MeV with a half-life of 245 days.

A standard solution of $Zn^{65}(IO_3)_2$ was prepared by quantitatively transferring weighed amounts of the tagged

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Table I. Solubiity Data on Solubility Product of Zinc Iodate

T, °C	$S \times 10^2$, M	I_{KNO_3}[a]	$I_{total} \times 10^2$	$\gamma\pm$	B'	A	$S_0 \times 10^2$	$K_{sp} \times 10^6$[b]
20.2	1.421	0	4.263	0.678	1.131	0.5074	0.9632	3.57 ± 0.21
	1.567	0.02500	7.201	0.615				
	1.643	0.05000	9.929	0.586				
	1.756	0.07500	12.768	0.548				
	1.814	0.1000	15.442	0.531				
28.4	1.654	0	4.962	0.668	1.404	0.5147	1.105	5.40 ± 0.20
	1.766	0.02500	7.798	0.626				
	1.880	0.05000	10.640	0.588				
	1.961	0.07500	13.383	0.563				
	2.025	0.1000	16.075	0.546				
40.6	1.893	0	5.679	0.648	1.351	0.5270	1.227	7.39 ± 0.36
	2.050	0.02500	8.650	0.599				
	2.171	0.05000	11.513	0.565				
	2.243	0.07500	14.229	0.547				
	2.327	0.1000	16.981	0.527				

[a] Contribution to the total ionic strength of the added salt, potassium nitrate. [b] Error reported is the maximum error based on the uncertainty in the least-squares extrapolated value of log S_0.

precipitate to volumetric flasks and dissolving the precipitate in 6M hydrochloric acid. For the solubility measurements, three samples of the radioactive precipitate were prepared for measurement at each ionic strength. The ionic strength was adjusted with potassium nitrate. Investigations by Stokes and Levien (*6*) had indicated no complex formation between the zinc and nitrate. Samples were equilibrated with shaking in constant-temperature water baths controlled to ±0.2°C by thermoregulators. The solubility of the salt was monitored daily; equilibration was generally attained after two days.

The activity of the sample solutions was determined by counting 5-ml aliquots of each sample on a NaI(Tl) scintillation counter over a period of days to ensure equilibration conditions. The samples were prepared by centrifuging 10 ml of each sample and pipeting 5 ml of the supernatant solution into test tubes. A count rate of 5000 cpm was attained for each sample. All samples were counted for a time sufficient to minimize counting errors with respect to other experimental errors. The sample activity was compared to that of the standard.

A minimum of six determinations was made for each solubility. The standard deviation of an individual measurement was less than or equal to the error involved in controlling the temperature to ±0.2°C; hence, the solubilities reported are accurate to ±0.4%.

Results and Discussion

The solubility of $Zn(IO_3)_2$ and the solubility product constants are given in Table I. The solubility product constants were found by use of the Debye-Hückel relation,

$$\log S - \log S_0 = -\log \gamma\pm = \frac{AZ_+Z_-\sqrt{I}}{1 + B'\sqrt{I}}$$

A is a constant at each temperature and was taken from ref. *1*; Z_+ and Z_- are the charges on the ions; I is the ionic strength; B', a constant at each temperature, S is the solubility in mol liter^{-1}; and S_0 is the solubility at zero ionic strength. The value of B' was determined at each temperature by a computer-assisted least-squares program which minimized the square of the residuals between the solubility calculated for various values of B' and the experiment solubility. Table I also lists the values of S_0 and B' which give the best fit to experimental data as well as activity coefficients, calculated from S_0/S. The average deviations between the solubility calculated by using the best values of B' and S_0 and the experimental solubility are 0.009, 0.004, and 0.008 at 20.2°, 28.4°, and 40.6°C, respectively. The solubility product constant was calculated as 4 S_0^3.

Zinc iodate was assumed to be completely dissociated in solution. The pH of a saturated solution of zinc iodate is 5.1, which for an acid ionization constant of 0.18 (*2*), renders formation of the associated species, HIO_3, negligible. On the basis of these data and that of Saegusa (*4*), complex formation between zinc and iodate seems to be unimportant.

Interpolation of a log S vs. T^{-1} plot gives the solubility at 25°C to be 0.01542M. The K_{sp} at 25°C was found from a plot of log K_{sp} vs. T^{-1} to be 4.45×10^{-6}. Ricci and Nesse (*3*) have reported the solubility in water at this temperature to be 0.01548M. Saegusa (*4*) determined the solubility to be 0.01457M at 25°C and also reported K_{sp} to be 3.905×10^{-6}. Saegusa's data have been reanalyzed according to the methods outlined in this investigation; K_{sp} was recalculated to be $3.70 \pm 0.56 \times 10^{-6}$; the uncertainty reported is the same as that given in Table I. Within the limits of experimental error, the agreement between Saegusa's value for K_{sp} at 25°C and that obtained in this work is reasonable.

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