

| COMPONENTS: | | ORIGINAL MEASUREMENTS: |
|--|--|---|
| (1) Copper chlorate; Cu(ClO ₃) ₂ ; [14721-21-2] | | Meusser, A. |
| (2) Water; H ₂ O; [7732-18-5] | | Ber. Dtsch. Chem. Ges. <u>1902</u> , 35 , 1414-24. |

| VARIABLES: | PREPARED BY: |
|-----------------|------------------------------|
| T/K = 242 - 344 | H. Miyamoto and E.M. Woolley |

EXPERIMENTAL VALUES:**solubility of Cu(ClO₃)₂**

| t/°C | mass % (author) | mol/100 mol H ₂ O (compilers) | mol kg ⁻¹ (compilers) | nature of the solid phase |
|------|--------------------|---|-------------------------------------|---|
| -25 | 39.14 | 5.03 | 2.79 | ice |
| -12 | 30.53 | 3.44 | 1.91 | ice |
| -31 | 54.59 | 9.40 | 5.22 | Cu(ClO ₃) ₂ ·4H ₂ O |
| -21 | 57.12 | 10.41 | 5.78 | " |
| 0.8 | 58.51 | 11.02 | 6.12 | " |
| 18 | 62.17 | 12.85 | 7.13 | " |
| 45 | 66.17 | 15.29 | 8.49 | " |
| 59.6 | 69.42 | 17.75 | 9.85 | " |
| 71 | 76.90 | 26.02 | 14.45 | " |

AUXILIARY INFORMATION

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|--|---|
| Cu(ClO ₃) ₂ ·4H ₂ O and water were placed in a test tube and shaken for one hour. Aliquots of saturated solution were withdrawn with a pipet, and the Cu content determined gravimetrically as Cu ₂ S. Analysis of the solid phase gave the following: 76.90 mass % Cu(ClO ₃) ₂ and 23.10 mass % H ₂ O. This gives a mole ratio of H ₂ O to Cu(ClO ₃) ₂ of 3.84 which is slightly less than the theoretical value of 4.0. | Pure Cu(ClO ₃) ₂ ·4H ₂ O was recrystallized. 1.6576 g analyzed for Cu gave 0.4316 g Cu ₂ S which corresponds to a hydrate about 1 % lower than the tetrahydrate. |
| ESTIMATED ERROR: | |
| | Nothing specified. |
| REFERENCES: | |

| | |
|---|--|
| COMPONENTS: (1) Copper iodate; Cu(IO ₃) ₂ ; [13454-89-2] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Monk, C.B. Trans. Faraday Soc. 1951, 47, 285-91. |
| VARIABLES: T/K = 298 | PREPARED BY: E.M. Woolley and H. Miyamoto |

EXPERIMENTAL DATA:

The solubility of Cu(IO₃)₂ in pure water at 25°C was given as:

| batch | solubility mol dm ⁻³ | log K _{s0} ^a | K _{s0} ^b mol ³ dm ⁻⁹ |
|-------|------------------------------------|----------------------------------|---|
| 1 | 0.00330 | -7.1325 | 7.37 x 10 ⁻⁷ |
| 2 | 0.00333 | -7.1311 ^b | 7.39 x 10 ⁻⁷ |
| 3 | 0.00337 ^c | ---- | ----- |

^aK_{s0} was calculated by the authors from

$$\log K_{s0} = [\text{Cu}^{2+}][\text{IO}_3^-]^2 - 3[\text{I}^{1/2}/(1 + \text{I}^{1/2}) - 0.2\text{I}]$$

where I is the ionic strength and where formation of the species CuIO₃⁺ and HIO₃ is taken into account by using the following values for the ion pair dissociation constants: K_d(CuIO₃⁺) = 0.15 and K_d(HIO₃) = 0.165. Activity coefficients were estimated from the equation

$$\log y_z = -(z^2/2)[\text{I}^{1/2}/(1 + \text{I}^{1/2}) - 0.2\text{I}]$$

where z is the ionic charge of the species.

^bCalculated by the compilers.

^cThis third solubility value is asserted to be suspect by the authors.

AUXILIARY INFORMATION

| | |
|---|---|
| METHOD/APPARATUS/PROCEDURE: Saturating column method was used, and details are given in ref. (1). The solvent was allowed to flow through the saturator sufficiently slowly for equilibrium to be established. The saturated solutions were made acidic with dilute acetic acid, and a large excess of solid KI was added. The resulting mixture was titrated to determine iodate content with Na ₂ S ₂ O ₈ solution that had been standardized with Analytical Reagent KIO ₃ . | SOURCE AND PURITY OF MATERIALS: Cu(IO ₃) ₂ crystals were prepared by allowing dilute solutions of analytical grade CuSO ₄ and KIO ₃ to drop slowly into a large volume of hot water. The very fine crystals were washed out insofar as possible. |
| | ESTIMATED ERROR: Solv: nothing specified. Temp: precision ± 0.02 K. |
| | REFERENCES: (1) Wise, W.C.A.; Davies, C.W. J. Chem. Soc. 1938, 273. |

| | |
|---|--|
| COMPONENTS: (1) Copper iodate; Cu(IO ₃) ₂ ; [13454-89-2] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Lloyd, M.; Wycherley, V.; Monk, C.B. J. Chem. Soc. 1951, 1786-9. |
| VARIABLES: T/K = 298 | PREPARED BY: E.M. Woolley and H. Miyamoto |

EXPERIMENTAL DATA:

The solubility of Cu(IO₃)₂ in pure water at 25°C was given as:

| solubility mol dm ⁻³ | solubility mol dm ⁻³ | solubility mol dm ⁻³ |
|------------------------------------|------------------------------------|------------------------------------|
| 0.00333 | 0.00333 | 0.00333 |
| 0.00336 | 0.00333 | 0.00333 |
| 0.00333 | 0.00333 | 0.00333 |
| 0.00336 | 0.00336 | 0.00333 |
| 0.00333 | 0.00334 | 0.00333 |
| 0.00334 | 0.00333 | |

Accounting for the dissociation of the ion pair Cu(IO₃)⁺ using K_d = 0.15 mol dm⁻³ (assumed value as for the Ca complex reported in Davies, C.W. J. Chem. Soc. 1930, 2410 and 1938, 271), the authors calculated the thermodynamic solubility product from^a

$$\log K_{s0} = [\text{Cu}^{2+}][\text{IO}_3^-]^2 - 3\log (\text{AI}^{1/2}/(1 + \text{I}^{1/2}) - 0.2\text{AI})$$

where I is the ionic strength. At zero ionic strength the authors reported $\log K_{s0} = -7.1210$ (i.e. $K_{s0} = 7.57 \times 10^{-8}$ mol³ dm⁻⁹).

^aIn the original paper, the Debye-Hückel constant A was omitted from this equation.

AUXILIARY INFORMATION

| | |
|---|--|
| METHOD/APPARATUS/PROCEDURE: Saturating column method used as in (1) and modified in (2). A bulb containing the solvent solution was attached to a column containing Cu(IO ₃) ₂ , and the solution allowed to flow through the column at a rate sufficient to insure saturation (1). The modification (2) was to connect the column to a second parallel arm in which the saturated solution was collected. The entire apparatus was thermostated. A portion of the saturated solution was run through the saturating column a second time. The iodate concentrations of the saturated solutions were determined volumetrically by using Na ₂ S ₂ O ₃ solution previously standardized with KIO ₃ . | SOURCE AND PURITY OF MATERIALS: Cu(IO ₃) ₂ crystals were prepared by allowing concentrated solutions of CuSO ₄ and KIO ₃ to drip slowly into nearly boiling water. The product was ground and the "fines" washed out. |
| | ESTIMATED ERROR: Solv: nothing specified. Temp: precision ± 0.03 K. |
| | REFERENCES: (1) Bronsted, N.J.; La Mer, V.K. J. Am. Chem. Soc. 1924, 46, 555. (2) Money, R.W.; Davies, C.W. J. Chem. Soc. 1934, 400. |

| | | |
|--|---|--|
| COMPONENTS: (1) Silver chlorate; AgClO ₃ ; [7783-92-8] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Noonan, E.C. J. Am. Chem. Soc. 1948, 70, 2915-8. | |
| VARIABLES: T/K = 278.15, 288.15, 298.15 and 308.15 | PREPARED BY: H. Miyamoto and E.M. Woolley | |
| EXPERIMENTAL DATA: | | |
| t/°C | AgClO ₃ solubility mol/100 mol water | AgClO ₃ solubility ^a mol kg ⁻¹ |
| 5.0 | 0.801 ₇ | 0.445 ₀ |
| 15.0 | 1.148 ₁ | 0.637 ₃ |
| 25.0 | 1.604 ₀ | 0.890 ₄ |
| 35.0 | 2.235 ₃ | 1.240 ₈ |
| ^a Molalities calculated by the compilers. | | |
| AUXILIARY INFORMATION | | |
| METHOD/APPARATUS/PROCEDURE: Excess AgClO ₃ was placed into 6-8 ml Pyrex capsules, water was added, and the ampoules sealed. Equilibrium was approached from the high temperature side only. Samples were rotated 12 to 48 hours in a water bath controlled to \pm 0.05 K or better. They were then allowed to settle for one hour, and 2-5 cm ³ aliquots were withdrawn through glass wool. The samples were transferred to 30 cm ³ Pt crucibles, weighed to 1 mg and carefully evaporated and dried to constant mass (to 0.05 mg) in an oven or desiccator. Buoyancy corrections were applied. All determinations were performed in duplicate and repeated if discrepancies were greater than 0.5 %. | SOURCE AND PURITY OF MATERIALS: AgClO ₃ was prepared from NaClO ₃ and AgNO ₃ , and the product then recrystallized two to five times. Water was probably distilled from alkaline permanganate solution, and the electrolytic conductivity was checked. | |
| | ESTIMATED ERROR: Solv: precision at least \pm 0.5 %. Temp: precision \pm 0.05 K or better. | |
| | REFERENCES: | |

| | |
|--|---|
| COMPONENTS: (1) Silver bromate; AgBrO ₃ ; [7783-89-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Böttger, W. Z. Phys. Chem. 1903, 46, 521-619. |
| VARIABLES: T/K = 293.09 | PREPARED BY: H. Miyamoto and E. M. Woolley |

EXPERIMENTAL DATA:

The solubility of AgBrO₃ in water at 19.94°C was determined from measurements of the electrolytic conductivities of saturated solutions, $\kappa(sln)$, and of pure water, $\kappa(\text{water})$. For pure water, $\kappa(\text{water}) = 9.3 \times 10^{-7} \text{ S cm}^{-1}$, and for saturated solutions, the electrolytic conductivities are given in the following table.

| equilibration time hours | $\kappa(sln)$ 10^8 S cm^{-1} |
|-----------------------------|---|
| 26 | 665.0 |
| 8 | 663.8 |
| 11 | 663.8 |
| 8 | 664.2 |
| 19 | 663.5 |
| -- | 663.3 |
| average: | 663.9 |

The solubility S was calculated from the following two equations.

$$\kappa(\text{AgBrO}_3) = \kappa(sln) - \kappa(\text{water})$$

$$S = \frac{1000\kappa(\text{AgBrO}_3)}{(\lambda^\infty(\text{Ag}^+) + \lambda^\infty(\text{BrO}_3^-))}$$

For Ag⁺ and BrO₃⁻, $\lambda^\infty = 57.0$ and $48.3 \text{ S cm}^2 \text{ mol}^{-1}$, respectively, and the solubility is thus $0.00630_5 \text{ mol dm}^{-3}$, and $K_{s0} = S^2 = 3.97 \times 10^{-5} \text{ mol}^2 \text{ dm}^{-6}$.

AUXILIARY INFORMATION**METHOD/APPARATUS/PROCEDURE:**

Conductivity method. The conductivity cells which employed Pt electrodes was designed to prevent entrapment of air bubbles. After sealing, the entire cell was immersed in a water bath and rotated in the dark. Equilibrium was taken when the conductivity remained constant within experimental error (usually within 20-30 min). The bridge and the thermometer were calibrated, and the cell constants determined with 0.010 mol dm⁻³ KCl solution.

SOURCE AND PURITY OF MATERIALS:

Analytically pure chemicals (Merck) were used. AgBrO₃ was precipitated from AgNO₃ and KBrO₃ solutions. The ppt was stored in a dark grey bottle in a dark place. KCl was purified by precipitation from a saturated solution with alcohol. Laboratory distilled water was redistilled from a tin-plated still, and stored in a flask fitted with a drying tube containing NaOH and CaO.

ESTIMATED ERROR:

κ : accuracy $\pm 1 \times 10^{-6} \text{ S cm}^{-1}$ (compilers).
Soln: precision $\pm 15\%$ (compilers).
Temp: accuracy ± 0.01 to 0.02 K

REFERENCES:

| | |
|--|---|
| COMPONENTS: (1) Silver bromate; AgBrO ₃ ; [7783-89-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Longi, A. Gazz. Chim. Ital. 1883, 13, 87-9. |
| VARIABLES: T/K = 298 | PREPARED BY: B. Scrosati |

EXPERIMENTAL DATA:

The author reported that at 25°C, one g of AgBrO₃ dissolves in 595.1 g water. This is equivalent to 0.00712 mol kg⁻¹ (compiler).

The author also reported that at 25°C, one g AgBrO₃ dissolves in 597.73 cm³ water, and this is equivalent to 0.00710 mol dm⁻³ (compiler).

AUXILIARY INFORMATION

| | |
|---|--|
| METHOD/APPARATUS/PROCEDURE: Nothing specified, but the solubility was probably detd gravimetrically after evaporation to dryness. | SOURCE AND PURITY OF MATERIALS: Nothing specified. |
|---|--|

| | |
|--|---|
| COMPONENTS: (1) Silver bromate; AgBrO ₃ ; [7783-89-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Whitby, G. S. Z. Anorg. Chem. 1910, 67, 107-9 and 62-4. |
| VARIABLES: T/K = 300 | PREPARED BY: H. Miyamoto and E. M. Woolley |

EXPERIMENTAL DATA:

The solubility of AgBrO₃ in water at 27°C was given as 1.71 g dm⁻³. This is equivalent to 0.00725 mol dm⁻³ (compilers).

AUXILIARY INFORMATION

| | |
|---|--|
| METHOD/APPARATUS/PROCEDURE: Complete details given in the compilation of this author's simultaneous study of the system AgIO ₃ -water. | SOURCE AND PURITY OF MATERIALS: Nothing specified. |
| ESTIMATED ERROR: Sol: precision ± 5 % (compilers). Temp: nothing specified. | ESTIMATED ERROR: Sol: precision ± 5 % (compilers). Temp: nothing specified. |

| | |
|--|---|
| COMPONENTS: (1) Silver bromate; AgBrO ₃ ; [7783-89-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Reedy, J. H. J. Am. Chem. Soc. 1921, 43, 1440-5. |
| VARIABLES: T/K = 298 - 363 | PREPARED BY: H. Miyamoto |
| EXPERIMENTAL DATA: | |
| t/°C | solubility of AgBrO ₃ ^a g/100 g H ₂ O 10 ³ mol kg ⁻¹ |
| 25 | 0.196 8.31 |
| 30 | 0.227 9.63 |
| 35 | 0.269 11.41 |
| 40 | 0.316 13.40 |
| 45 | 0.371 15.74 |
| 50 | 0.433 18.36 |
| 55 | 0.497 21.08 |
| 60 | 0.570 24.18 |
| 65 | 0.648 27.48 |
| 70 | 0.735 31.17 |
| 75 | 0.832 35.29 |
| 80 | 0.936 39.70 |
| 85 | 1.055 44.75 |
| 90 | 1.325 56.20 |

^aMolalities calculated by the compiler.

Based on emf measurements, the author reported a solubility of 0.00827 mol dm⁻³ at 25°C.

AUXILIARY INFORMATION

| | |
|--|--|
| METHOD/APPARATUS/PROCEDURE: Primary method was standard isothermal method where aliquots of solutions saturated at various temperatures were removed, placed in glass stoppered bottles and weighed. The solubilities were detd iodometrically by adding excess KI, dil HCl, and then titrating with standard thiosulfate solution. The solubility at 25°C was also determined by emf measurements on the cell: $\text{Ag},\text{AgBrO}_3(\text{s}) \mid \text{KBrO}_3(\text{c}), \text{AgBrO}_3(\text{satd})$ con KNO ₃ AgNO ₃ (c) Ag | SOURCE AND PURITY OF MATERIALS: Technical grade AgBrO ₃ prep'd by reaction of excess bromine with AgNO ₃ solution. The product was purified by extraction with hot water, recrystallized, washed and dried in vacuum. The purity was 99.6 to 100 %, detd gravimetrically. Two crystalline forms of AgBrO ₃ were obtained: a metastable "hair form" stable above 98.50°C, and a stable "tetragonal" form stable below 98.50°C. |
| For c = 0.1 mol dm ⁻³ , the emf of this cell is 0.1193 V. Assuming KBrO ₃ is 82.5 % dissociated and AgBrO ₃ is 98 % dissociated, the soly was calcd to be 0.00827 mol dm ⁻³ . | ESTIMATED ERROR: Nothing specified. |
| Four data points for the soly of metastable AgBrO ₃ were reported graphically. They show increased soly, as expected, and appear to be associated with a large experimental error. | REFERENCES: |

| | | | |
|--|---|---|---------------------------------------|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | | ORIGINAL MEASUREMENTS: Noyes, A.A.; Kohr, D.A. J. Am. Chem. Soc. 1902, 24, 1141-8. | |
| VARIABLES: T/K = 298 | | PREPARED BY: H. Miyamoto | |
| EXPERIMENTAL DATA: | | | |
| solubility from undersaturation | | solubility from supersaturation | |
| g AgIO ₃ in 250 cm ³ sln | 10^4mol dm^{-3} ^a | g AgIO ₃ in 250 cm ³ sln | 10^4mol dm^{-3} ^a |
| 0.0109 | 1.86 | 0.0112 | 1.91 |
| 0.0107 | 1.82 | 0.0113 | 1.93 |
| 0.0112 | 1.91 | 0.0117 | 1.99 |
| 0.0108 | 1.84 | 0.0106 | 1.81 |
| 0.0111 | 1.89 | 0.0114 | 1.94 |
| averages: 0.0109 ₄ | 1.86 | averages: 0.0112 ₂ | 1.92 |
| ^a Calculated by the compiler. | | | |
| AUXILIARY INFORMATION | | | |
| METHOD/APPARATUS/PROCEDURE: AgIO ₃ and pure water were rotated in a thermostat at 25°C for 4 or 5 hours. Saturation was approached from both undersaturation and from supersaturation. After allowing the solid particles to settle for a short time, the solutions were filtered by suction. AgI was precipitated from the saturated solutions by addition of KI. The precipitate was collected in a platinum Gooch crucible upon a layer of finely divided Pt, dried at 160°C, and weighed. | SOURCE AND PURITY OF MATERIALS: AgIO ₃ was precipitated from solutions of (recrystallized) Ag ₂ SO ₄ and KIO ₃ . The precipitate was washed with hot water. | ESTIMATED ERROR: Solv: standard deviation about 4 %. Temp: nothing specified. | |
| | | | |
| REFERENCES: | | | |

| | |
|--|--|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Böttger, W. |
|--|--|

| | |
|----------------------------------|---|
| VARIABLES: T/K = 293.1 | PREPARED BY: H. Miyamoto and E.M. Woolley |
|----------------------------------|---|

EXPERIMENTAL DATA:

| t/°C | equilibration time (hours) | $\kappa(\text{sln})$ 10^6 S cm^{-1} | $\kappa(\text{water})$ 10^6 S cm^{-1} |
|-------|----------------------------|--|--|
| 19.96 | 36 | 14.14 | 0.770 |
| 19.96 | 69 | 14.09 | 0.770 |
| 19.96 | 67 | 14.11 | 0.770 |
| 19.94 | 15 | 14.06 | 1.18 |
| 19.94 | 5 | 13.91 | 1.18 |
| 19.94 | 87 | 13.88 | 1.18 |
| 19.94 | 7 | 14.02 | 1.18 |
| 19.94 | 8 | 14.00 | 1.18 |
| 19.94 | 34 | 14.15 | 1.06 |
| 19.94 | 43 | 14.12 | 1.06 |
| 19.94 | 37 | 14.11 | 1.06 |
| 19.95 | 26 | 14.36 ^a | 1.32 |
| 19.95 | 92 | 14.36 ^a | 1.32 |
| 19.95 | 36 | 14.38 ^a | 1.32 |
| 19.94 | 51 | 14.72 ^a | 1.302 |
| 19.94 | 42 | 14.31 ^a | 1.27 |
| 19.94 | 35 | 14.29 ^a | 1.27 |

^aAverage $\kappa(\text{sln}) = 1.405 \times 10^{-6} \text{ S cm}^{-1}$ not including these values. Using this average and molar conductances of 57.0 and 35.5 $\text{S cm}^2 \text{ mol}^{-1}$ for λ^∞ for Ag^+ and IO_3^- , respectively, the author computes a solubility of $1.519 \times 10^{-4} \text{ mol dm}^{-3}$ from eqs. [1] and [2]. $K_{s0} = S^2 = 2.31 \times 10^{-8} \text{ mol}^2 \text{ dm}^{-6}$.

$$\kappa(\text{AgIO}_3) = \kappa(\text{sln}) - \kappa(\text{water}) \quad [1]$$

$$S = 1000 \kappa(\text{AgIO}_3) / (\lambda^\infty(\text{Ag}^+) + \lambda^\infty(\text{IO}_3^-)) \quad [2]$$

AUXILIARY INFORMATION

| | |
|---|---|
| METHOD/APPARATUS/PROCEDURE: The solubility was determined by conductivity measurements. The conductivity cells which employed Pt electrodes were designed to prevent entrapment of air bubbles. After sealing, the entire cell was immersed in a water bath and rotated in the dark. Equilibrium was taken when the electrolytic conductivity was constant within experimental error (usually within 20 to 30 minutes). The bridge and the thermometer were calibrated, and the cell constants determined by using 0.010 mol dm ⁻³ KCl solution. | SOURCE AND PURITY OF MATERIALS: Analytically pure chemicals (Merck) were used. AgIO ₃ was precipitated from cold AgNO ₃ and KIO ₃ solutions. Part of the precipitate was washed several times in diffused daylight, and the residual parts were filtered off, dried, and stored. KCl was purified by precipitation from a saturated aqueous solution with alcohol. Laboratory distilled water was redistilled from a tin-plated still and stored in a flask fitted with a drying tube with NaOH and CaO. |
| | ESTIMATED ERROR: κ : precision $\pm 1 \times 10^{-6} \text{ S cm}^{-1}$ (compilers). Solv: precision $\pm 20\%$ (compilers). Temp: accuracy $\pm 0.02 \text{ K}$. |

| | |
|--|---|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Sammet, V. Z. Phys. Chem. 1905, 53, 641-91. |
| VARIABLES: T/K = 298 and 333 K | PREPARED BY: H. Miyamoto and E.M. Woolley |

EXPERIMENTAL DATA:

Solubility products were calculated from emf measurements on the following cell:

| Ag AgNO ₃ (c ₁) KNO ₃ (c ₁) KIO ₃ (c ₂) AgIO ₃ , Ag [1] | | | | | |
|---|--|--|-------------------------|---|---|
| t/°C | c ₁ mol dm ⁻³ | c ₂ mol dm ⁻³ | E ₁ volts | 10 ⁸ K _{s0} ^a mol ² dm ⁻⁶ | 10 ⁸ K _{s0} ^b mol ² dm ⁻⁶ |
| 25 | 0.1 | 0.01 | 0.249 | 4.49 | 6.2 |
| | 0.1 | 0.01 | 0.250 | 4.34 | 6.0 |
| | 0.1 | 0.01 | 0.248 | 4.72 | 6.5 |
| | 0.1 | 0.1 | 0.303 | 4.60 | 7.6 |
| | 0.1 | 0.1 | 0.297 | 5.70 | 9.6 |
| | 0.1 | 0.1 | 0.305 | 4.36 | 7.0 |
| 60 | 0.1 | 0.01 | 0.214 | 42.94 | 58 |
| | 0.1 | 0.01 | 0.213 | 44.00 | 60 |
| | 0.1 | 0.01 | 0.213 | 44.00 | 60 |
| | 0.1 | 0.1 | 0.279 | 40.70 | 60 |
| | 0.1 | 0.1 | 0.278 | 42.19 | 62 |

^aAuthor's values, evidently including activity coefficients.

^bCompilers' calculations for concentration solubility products from $\ln K_{s0} = -E_1 F/RT + \ln(c_1 c_2)$.

AUXILIARY INFORMATION

| | |
|---|--|
| METHOD/APPARATUS/PROCEDURE: Emf measurements on cell [1] were not described in detail. Corrections for liquid junction potentials were not made. Activity corrections were made by the method of incomplete dissociation of AgNO ₃ and KIO ₃ solutions. | SOURCE AND PURITY OF MATERIALS: Nothing specified. |
| | ESTIMATED ERROR: Nothing specified. |
| | REFERENCES: |

| | |
|--|---|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Kohlrausch, F. Z. Phys. Chem. 1908, 64, 129-69. |
| VARIABLES: T/K = 282.4, 291.1, 291.5 and 299.8 | PREPARED BY: H. Miyamoto and E.M. Woolley |

EXPERIMENTAL DATA:

| t/°C | $\kappa(\text{AgIO}_3)$ 10 ⁶ S cm ⁻¹ | soly 10 ⁴ mol dm ⁻³ | soly g dm ⁻³ | $\kappa^*(\text{AgIO}_3)$ 10 ⁶ S cm ⁻¹ |
|-------|---|--|----------------------------|---|
| 9.43 | 8.48 | 0.97 ₁ | 0.0275 | 6.86 |
| 18.00 | 11.90 | 1.36 ₃ | 0.0385 | 11.90 |
| 18.37 | 12.07 | 1.38 ₂ | 0.0391 | 12.17 |
| 26.60 | 16.61 | 1.90 ₆ | 0.0539 | 20.02 |

For pure water the author states that $\kappa(\text{water}) = 1.10$ to $1.23 \times 10^6 \text{ S cm}^{-1}$, but individual values for each temperature are not given. There is some confusion as to the significance of $\kappa^*(\text{AgIO}_3)$ values. The solubilities were calculated from the corrected $\kappa(\text{AgIO}_3)$ values (eqs. [1] and [2] below), and the $\kappa^*(\text{AgIO}_3)$ values are probably the actual measured values subject to corrections for temperature changes in the molar conductivities. The effect of temperature on the electrolytic conductivities is given in eq. [3] below.

At 18°C, the molar conductivities (infinite dilution) of Ag⁺ and IO₃⁻ are 54.3 and 33.9 S cm² mol⁻¹, respectively, and individual values corrected for finite concentrations for each temperature are given below. Eqs. [1] and [2] were used to calculate the solubilities.

$$\kappa(\text{AgIO}_3) = \kappa(\text{sln}) - \kappa(\text{water}) \quad [1]$$

$$\text{solubility} = 1000 \kappa(\text{AgIO}_3)/\Lambda \quad [2]$$

AUXILIARY INFORMATION

| | | | | | | | | | | | |
|--|--|-----------|------|------|-------|------|-------|------|-------|------|---|
| METHOD/APPARATUS/PROCEDURE: Temperature dependencies were calculated from $\kappa_t = \kappa_{18}[1 + \alpha(t - 18) + \beta(t - 18)^2] \quad [3]$ where $\alpha = 0.0231$ and $\beta = 0.00009$. The data given in the above table are not fully explained by this equation | SOURCE AND PURITY OF MATERIALS: AgIO ₃ was prepared from solutions of AgNO ₃ and NaIO ₃ . The precipitate was dried and powdered in the dark. | | | | | | | | | | |
| The molar conductances corrected for finite concentrations are given below (Λ units are S cm ² mol ⁻¹). <table border="1"> <tr> <td>t/°C</td> <td>Λ</td> </tr> <tr> <td>9.43</td> <td>87.4</td> </tr> <tr> <td>18.00</td> <td>87.3</td> </tr> <tr> <td>18.37</td> <td>87.3</td> </tr> <tr> <td>26.60</td> <td>87.1</td> </tr> </table> | t/°C | Λ | 9.43 | 87.4 | 18.00 | 87.3 | 18.37 | 87.3 | 26.60 | 87.1 | ESTIMATED ERROR: Nothing specified. |
| t/°C | Λ | | | | | | | | | | |
| 9.43 | 87.4 | | | | | | | | | | |
| 18.00 | 87.3 | | | | | | | | | | |
| 18.37 | 87.3 | | | | | | | | | | |
| 26.60 | 87.1 | | | | | | | | | | |
| | REFERENCES: | | | | | | | | | | |

| | |
|--|--|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Whitby, G.S. Z. Anorg. Chem. 1910, 67, 62-4 and 107-9. |
| VARIABLES: T/K = 293 | PREPARED BY: H. Miyamoto and E.M. Woolley |

EXPERIMENTAL DATA:

The solubility of AgIO₃ in water at 20°C was given as 0.039 g dm⁻³.

From this value, the compilers calculate a solubility of 1.38 × 10⁻⁴ mol dm⁻³.

AUXILIARY INFORMATION

| | |
|---|---|
| METHOD/APPARATUS/PROCEDURE: Saturated solutions were analyzed by diluting a portion to a known volume. To a 50 cm ³ portion of the diluted solution were added several drops of concentrated NaOH solution, and the resulting solution was placed in a boiling water bath for 2 minutes. 6 drops of 1 mol dm ⁻³ NaOH solution were added along with a small amount of sucrose, and the mixture heated 20 to 30 seconds, cooled, and the resulting yellowish color intensity measured colorimetrically. The intensity of these solutions were compared to the intensity of standard AgNO ₃ solutions treated in an identical manner. The author states that the detection limit for silver is 4 × 10 ⁻⁶ g dm ⁻³ . | SOURCE AND PURITY OF MATERIALS: Nothing specified. |
| | ESTIMATED ERROR: Solv: precision ± 5 % (compilers). Temp: nothing specified. |
| | REFERENCES: |

| | |
|--|--|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Baxter, W.P. J. Am. Chem. Soc. 1926, 48, 615-21. |
| VARIABLES: T/K = 348.15 | PREPARED BY: E.M. Woolley |

EXPERIMENTAL DATA:

| detmn No. | solubility 10 ³ mol kg ⁻¹ | No. of expts | deviations from the mean | | method of AgIO ₃ prep'n |
|-----------|--|-----------------|--------------------------|-----------|---------------------------------------|
| | | | max/% | average/% | |
| 1 | 0.8415 | 4 | 0.17 | -- | 1 |
| 2 | 0.8414 | 3 | 0.12 | -- | 1 |
| 3 | 0.8411 | 4 | 0.39 | -- | 2 |
| 4 | 0.8395 | 5 | 0.43 | -- | 3 |
| 5 | 0.8371 | 5 | 0.43 | -- | 4 |
| 6 | 0.8403 | 9 | -- | 0.07 | ? |
| 7 | 0.8416 | 3 | -- | 0.04 | ? |
| 8 | 0.8403 | 9 | -- | 0.07 | ? |
| 9 | 0.8373 | 5 | -- | 0.08 | ? |
| 10 | 0.8417 | 4 | -- | 0.06 | ? |
| 11 | 0.8417 | 4 | -- | 0.06 | ? |

Determinations 6 to 11 are specified as referring to "weighed in air." Buoyancy corrections would make the resulting solubilities smaller by less than about 0.1 %. Determinations 1 to 5 are specified as referring to mmol per "1000 g solution," whereas determinations 6 to 11 refer to mmol per "1000 g water." This would make only about 0.024 % difference in the solubilities reported by these two methods. Determinations 10 and 11 appear to refer to the same experiments as do determinations 6 and 8. The average of all values (except 8 and 11) is 0.839₆ × 10⁻³ mol kg⁻¹ with a standard deviation of 0.001₇.

AUXILIARY INFORMATION

| METHOD/APPARATUS/PROCEDURE: | SOURCE AND PURITY OF MATERIALS: |
|--|---|
| 1.5 g AgIO ₃ crystals were rotated with 350 cm ³ water in bottles made of Pyrex tubing and were sealed. The bottles were rotated in a thermostat maintained at 75.00°C for 20 to 100 hours, and equilibrium was approached from both above and below. The bottles were then placed in a rack in the thermostat, the tip of a side tube broken off, and a hole blown in the top neck through which a heated delivery tube was introduced. The tube contained a wad of asbestos fibers. A sample of 240-300 g of satd sln was removed by using compressed air to force the sln through the delivery tube and the asbestos filter. These aliquots were delivered into weighed glass-stoppered flasks containing 10 cm ³ of dil HCl. After weighing, the contents of the flask were cooled, 2 g KI added, and the liberated I ₂ titrated with standardized Na ₂ S ₂ O ₃ . | Initial prepn of AgIO ₃ by mixing slns of AgNO ₃ and slight excess of warm 0.15 mol dm ⁻³ KIO ₃ . The ppt was washed with cold water, 6-8 liters of hot water, and dried at 110°C for 2 hours. The following correspond to the preparation number given in the above table. Prepn 1 and 2: the initial AgIO ₃ was divided into 2 parts (i.e. they are the same). Prepn 3. The initial ppt was dissolved in dil NH ₃ solution, pptd with HNO ₃ , and washed and dried as above. Prepn 4. These were solid residues from soly determinations using AgIO ₃ from prepn's 1-3. These residues were dissolved in dil NH ₃ and treated as in 3 above. Ordinary distd water was redistd from Ag ₂ SO ₄ sln and then distd once more. |
| ESTIMATED ERROR: | Solv: reproducibility within 0.2 %. Temp: precision ± 0.02 K. |

| | |
|---|---|
| COMPONENTS: (1) Silver iodate; AgIO_3 ; [7783-97-3] (2) Water; H_2O ; [7732-18-5] | ORIGINAL MEASUREMENTS: Kolthoff, I.M.; Lingane, J.J. <i>J. Phys. Chem.</i> 1938, 42, 133-40. |
| VARIABLES: $T/K = 298.15$ | PREPARED BY: E.M. Woolley |

EXPERIMENTAL DATA:

| initial mass of AgIO_3 grams | numb of expts | average total silver content mmol dm^{-3} | average total iodate content mmol dm^{-3} | $10^8 K_{s0}^a$ $\text{mol}^2 \text{dm}^{-6}$ | calcd solv $(K_{s0})^{1/2}$ mmol dm^{-3} |
|---|------------------|--|--|--|---|
| 0.05 | 4 | 0.1633 | 0.1839 | 3.00 | 0.173 |
| 5.0 | 3 | 0.1630 | 0.1910 | 3.11 | 0.176 |
| 0.05 | 1 ^b | 0.176 | 0.180 | 3.17 | 0.178 |
| 0.1 | 5 ^b | 0.1750 | 0.1796 | 3.143 | 0.1773 |
| 3.0 | 1 ^b | 0.176 | 0.181 | 3.18 | 0.179 |
| 0.3 | 3 ^b | 0.1761 | 0.1780 | 3.13 | 0.177 ^c |

^aSolubility product K_{s0} calculated from $[\text{Ag}^+}_{\text{total}}[\text{IO}_3^-]_{\text{total}}$.^bParaffin-coated bottles used.^cThe authors give an "extrapolated" value of $1.744 \times 10^{-4} \text{ mol dm}^{-3}$ for the solubility at zero ionic strength. The extrapolation was based on this data point and the solubilities in KNO_3 solutions (see the compilation of the $\text{AgIO}_3\text{-KNO}_3\text{-H}_2\text{O}$ system by these authors). Based on the extrapolated solubility at zero ionic strength, the authors computed the thermodynamic solubility product $K_{s0}^0 = 3.04 \times 10^{-8} \text{ mol}^2 \text{dm}^{-6}$.**AUXILIARY INFORMATION**

| | |
|---|--|
| METHOD/APPARATUS/PROCEDURE: AgIO_3 crystals and 200 cm^3 water placed in either plain or paraffin-coated brown glass bottles stoppered with paraffined corks. The bottles were rotated for 3 h in a thermostat at 25°C . Analyses showed that equilibrium was established within one hour. 100 cm^3 samples were withdrawn through a filter pipet with cotton affixed to the tip. The first portion of solution that was withdrawn was discarded, and about 100 cm^3 analyzed for both silver and iodate. Silver was determined by potentiometric titration with $0.001 \text{ mol dm}^{-3}$ KI solution delivered from a calibrated 10-ml microburet. Iodate was determined by iodometric titration with freshly prepared and standardized 0.01 mol dm^{-3} thiosulfate using a calibrated microburet. | SOURCE AND PURITY OF MATERIALS: AgIO_3 prepared by rapid precipitation using dilute KIO_3 (slight excess) and AgNO_3 solutions. KIO_3 was recrystallized three times. AgNO_3 was "pure." The precipitate was aged for 4 days in the mother solution, and then washed twelve times with conductivity water. It was dried in a vacuum oven for 10 hours at 550°C . The AgIO_3 was then recrystallized from 1 mol dm^{-3} HNO_3 . Conductivity water had an electrolytic conductance of $1.4 \times 10^{-6} \text{ S cm}^{-1}$. |
| | ESTIMATED ERROR: Titrs: precision $\pm 0.2\%$ for Ag and $\pm 0.3\%$ for iodate. Temp: precision $\pm 0.02 \text{ K}$. |
| | REFERENCES: |

| | |
|--|--|
| COMPONENTS: (1) Silver iodate; AgIO ₃ ; [7783-97-3] (2) Water; H ₂ O; [7732-18-5] | ORIGINAL MEASUREMENTS: Ricci, J.E.; Amron, I. J. Am. Chem. Soc. 1951, 73, 3613-8. |
| VARIABLES: T/K = 298 and 318 | PREPARED BY: H. Miyamoto |

EXPERIMENTAL DATA:

| t/°C | solubility g dm ⁻³ | solubility ^a 10 ⁴ mol dm ⁻³ |
|------------|----------------------------------|---|
| 25 | 0.0506 | 1.79 |
| 25 | 0.0506 | 1.79 |
| 25 | 0.0512 | 1.81 |
| 25 | 0.0511 | 1.81 |
| 25 | 0.0507 | 1.79 |
| 25 | 0.0509 | 1.80 |
| average 25 | 0.0508 | 1.80 |
| 45 | 0.0995 | 3.52 |
| 45 | 0.0997 | 3.53 |
| average 45 | 0.0996 | 3.52 |

^aCalculated by the compiler.

AUXILIARY INFORMATION

| | |
|---|---|
| METHOD/APPARATUS/PROCEDURE: Isothermal method. Excess silver iodate and freshly boiled, distilled water were placed in Pyrex bottles and rotated in a large constant temperature water bath. At 25°C the bottles were rotated for 7 days and 5 months, and at 45°C, the bottles were rotated for 2 days. After allowing the solid to settle, the saturated solutions were sampled with calibrated delivery pipets fitted with filter paper tips. Solutions analyzed for iodate with sodium thiosulfate. | SOURCE AND PURITY OF MATERIALS: Commercial AgIO ₃ was purified by recrystallization or by washing with warm dilute nitric acid and water. The product was dried at 100°C. The purity of the solid was determined by both iodometric titration (99.9-100.0 %) and by gravimetric silver determination (99.6 %). |
| | ESTIMATED ERROR: Sol: precision \pm 0.8 % deviation from the mean. Temp: precision probably \pm 0.05 K (compiler). |
| | REFERENCES: |