COMPONENTS:

1. Copper(II) selenite; $CuSeO_3$; [10214-40-1]
2. Water; H_2O; [7732-18-5]

ORIGINAL MEASUREMENTS:

Ripan, R.; Vericeanu, G.

Studia Univ. Babes-Bolyai, Ser. Chim. 1968, *13*, 31-37.

VARIABLES:

One temperature: 291 K

PREPARED BY:

Mary R. Masson

EXPERIMENTAL VALUES:

All concentrations are expressed in units of mol dm^{-3}.

Concentration	K_{s0} $mol^2\ dm^{-6}$	Mean K_{s0}	pK_{s0}
1.747×10^{-4}	2.9×10^{-8}	$3.2 \pm 0.4 \times 10^{-8}$	7.49
1.741×10^{-4}	3.1×10^{-8}		
1.855×10^{-4}	3.4×10^{-8}	$mol^2\ dm^{-6}$	
1.848×10^{-4}	3.4×10^{-8}		
1.820×10^{-4}	3.3×10^{-8}		
1.880×10^{-4}	3.4×10^{-8}		

The concentration c in the saturated solution was calculated from the measured conductivity κ from the equation

$$c = \frac{1000\kappa}{\Lambda^\circ}$$

Compiler's note

Neither in the determination of the ionic conductivity of the selenite ion nor in the evaluation of the solubility product was hydrolysis of the selenite ion taken into account. This would give rise to errors, since, for example, in a 0.001M solution, $[SeO_3^{2-}] = 0.000955M$, $[HSeO_3^-] = 0.000045M$ and $[OH^-] = 0.000045M$, and hydroxide and hydrogen selenite have different ionic conductivities from selenite. If the ionic conductivity of hydrogen selenite were known, the experimental results could have been interpreted correctly (cf. ref. 2), but this value does not seem to be available.

However, because the calibration and sample solutions had concentrations of about the same order of magnitude, the errors would cancel to some extent, but the K_{s0} value cannot be regarded as reliable.

AUXILIARY INFORMATION

METHOD APPARATUS/PROCEDURE:

The ionic conductivity of the selenite ion in water was determined by measuring the mean molar conductivities of a series of aqueous solutions of lithium selenite with concentrations below 2×10^{-3} mol dm^{-3}. The mean molar conductivity at infinite dilution was found by extrapolation to be $172 \pm 2.9\ \Omega^{-1}cm^2mol^{-1}$ at 18°C. At that temperature, the ionic conductivity of the lithium ion is $33.4\ \Omega^{-1}cm^2mol^{-1}$, so the ionic conductivity of the selenite ion is $105.2\ \Omega^{-1}cm^2mol^{-1}$.

The well washed copper selenite was mixed with 150 ml of water and agitated intermittently for 1 hr. From this, 10-20 ml was taken in the conductivity cell and the conductivity measured. The sampling and measurement were repeated until a constant value for the conductivity was obtained.

The value of $\Lambda^\circ = (\lambda_+ + \lambda_-)$, the molar conductivity, was calculated with $\lambda_- = 105.2$ and $\lambda_+ = 90.6\ \Omega^{-1}cm^2mol^{-1}$.

SOURCE AND PURITY OF MATERIALS:

Lithium selenite was prepared from sublimed selenium dioxide by neutralization with lithium hydroxide. An approximately 0.05M solution was standardized gravimetrically, and this was used to prepare the various dilutions.

The composition of the selenite was checked by analysis.

ESTIMATED ERROR:

Temperature: ±0.5 K

Error in K_{s0} $(2s) = 0.4 \times 10^{-8}$ (compiler)

REFERENCES:

1. Landolt-Bornstein *Physicalisch-Chemische Tabellen II* 1923, p. 1105.
2. Monk, C.B. *J. Chem. Soc.* 1949, 429.

COMPONENTS:

1. Copper selenite; $CuSeO_3$; [10214-40-1]

2a. Nitric acid; HNO_3; [7697-37-2]

2b. Sulfuric acid; H_2SO_4; [7664-93-9]

3. Water; H_2O; [7732-18-5]

ORIGINAL MEASUREMENTS:

Chukhlantsev, V.G.

Zh. Neorg. Khim. 1956, *1*, 2300-5; **Russ. J. Inorg. Chem.* 1956, *1*, 132-8.

VARIABLES:

HNO_3 and H_2SO_4 concentrations

One temperature: 293 K

PREPARED BY:

Mary R. Masson

EXPERIMENTAL VALUES:

All concentrations are expressed in units of mol dm^{-3}.

Soln.	Initial pH	Final pH	$[Cu^{2+}]$	pCu	log $\alpha_{L(H)}$	$p[SeO_3^{2-}]$	pK_{s0}
HNO_3	2.97	6.39	5.38×10^{-4}	3.27	1.60	4.87	8.14
	2.27	5.63	2.12×10^{-3}	2.67	2.37	5.04	7.71
	2.00	5.40	3.41×10^{-3}	2.47	2.61	5.08	7.55
H_2SO_4	2.53	5.86	1.11×10^{-3}	2.96	2.12	5.08	8.04
	2.12	5.58	3.54×10^{-3}	2.45	2.40	4.85	7.30
	2.03	5.45	4.03×10^{-3}	2.40	2.55	4.95	7.35

The average value is $K_{s0} = 2.09 \times 10^{-8}$ mol^2dm^{-6}.

$(pK_{s0} = 7.68)$

Notes.

$[Se_{tot}] = [Cu^{2+}]$ and $[SeO_3^{2-}] = [Se_{tot}]/\alpha_{L(H)}$

where $\alpha_{L(H)} = (1 + [H^+]/K_2 + [H^+]^2/K_1K_2)$

and the acid dissociation constants have the values $K_1 = 4 \times 10^{-3}$ and $K_2 = 1.0 \times 10^{-8}$ (ref. 1).

AUXILIARY INFORMATION

METHOD APPARATUS/PROCEDURE:

Solutions of nitric and sulfuric acids were saturated with copper selenite by stirring in a thermostat at 20°C for 8 hr. The remaining solid phase was removed by centrifugation, then the pH was measured ("Moskip" pH meter, to 0.01 pH unit) and the copper concentration was determined (method not stated).

SOURCE AND PURITY OF MATERIALS:

C.P.-grade reagents were used. Copper selenite was prepared by mixing a 0.1*N* solution of copper sulfate with a 5% excess of 0.1*N* sodium selenite solution, in the cold. After 24 hours standing, the precipitate was separated by centrifugation and washed with water. Copper was determined as the element after precipitation on a platinum net, and selenium was determined gravimetrically as the element.

ESTIMATED ERROR:

The spread in the results is 0.84 of a log unit.

Temperature: probably ±0.05 K

REFERENCES.

1. Rumpf, P. *Compt. Rendu* 1933, *197*, 686.

COMPONENTS:

1. Copper(II) selenite; $CuSeO_3$; [10214-40-1]
2a. Ammonia solution; [1336-21-6]
2b. Hydrochloric acid; [7647-01-0]
2c. Sulfuric acid; [7697-37-2]
2d. Acetic acid;
3. Water; H_2O; [7732-18-5]

ORIGINAL MEASUREMENTS:

Geilman, W.; Wrigge, W.

Z. Anorg. Allgem. Chem. 1931, *197*, 353-63.

VARIABLES:

One temperature, presumably ambient.

PREPARED BY:

Mary R. Masson

EXPERIMENTAL VALUES:

The concentrations of Cu and Se are expressed in units of mg/250 ml.

Normality* of Solvent	Ammoia solution		Hydrochloric acid		Sulfuric acid		Acetic acid	
	[Cu]	[Se]	[Cu]	[Se]	[Cu]	[Se]	[Cu]	[Se]
0.0 (water)	1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0
0.01	2.2	13.8	38.9	48.9	55.8	68.7	3.2	3.9
0.02	6.6	26.1	92.6	115.0	109.0	134.7	13.4	16.6
0.05	45.5	116.5	233.2	288.0	244.8	301.4	19.0	28.8
0.10	181.1	285.1	560.6	698.4	560.6	698.4	25.1	31.3
0.20	560.6	698.4	"	"	"	"	32.1	40.0
0.50	"	"	"	"	"	"	46.2	58.4
1.00	"	"	"	"	"	"	60.6	75.7
2.00	"	"	"	"	"	"	85.7	106.5

[a] For ammonia solution, hydrochloric acid and acetic acid, the normality is equal to the concentration expressed in mol dm^{-3}. For sulfuric acid, the normality must be divided by 2 to obtain the concentration in mol dm^{-3}.

A value for the solubility product can be obtained from the data for aqueous solutions. 1.6 mg/250 ml or copper = 0.0064 g/l. = 0.0001007*M* and 2.0 mg/250 ml of Se = 0.008 g/l. = 0.0001013*M*.
Thus, the solubility product is

$$K_{s0} = 1.02 \times 10^{-8} \text{ mol}^2 \text{ dm}^{-6} \quad (pK_{s0} = 7.99).$$

AUXILIARY INFORMATION

METHOD APPARATUS/PROCEDURE:

The copper selenite dihydrate (2-g samples) was digested with 250 ml of each solvent, for 24 hr. Selenium in the filtrate was determined as the element after reduction with sulfur dioxide in concentrated hydrochloric acid medium. Dissolved copper was determined in the filtrate from the selenium determination by precipitation with hydrogen sulfide.

Note: data are also given from experiments on the relative rates of dissolution of copper selenite and copper sulfide, in the presence and absence of air or hydrogen peroxide.

SOURCE AND PURITY OF MATERIALS:

Not stated.

ESTIMATED ERROR:

No estimates possible.

REFERENCES: