

COMPONENTS: 1. Cadmium selenite; CdSeO_3 ; [13814-59-0] 2. Water; H_2O ; [7732-18-5]	ORIGINAL MEASUREMENTS: Ripan, R.; Vericeanu, G. <i>Studia Univ. Babeş-Bolyai, Ser. Chim.</i> 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} . <table border="1" data-bbox="241 493 1014 715"> <thead> <tr> <th>Concentration</th> <th>K_{SO} $\text{mol}^2 \text{dm}^{-6}$</th> <th>Mean K_{SO} $\text{mol}^2 \text{dm}^{-6}$</th> <th>$\text{p}K_{\text{SO}}$</th> </tr> </thead> <tbody> <tr> <td>8.152×10^{-5}</td> <td>6.6×10^{-9}</td> <td rowspan="2">$6.0 \pm 1.1 \times 10^{-9}$</td> <td rowspan="2">8.22</td> </tr> <tr> <td>8.075×10^{-5}</td> <td>6.5×10^{-9}</td> </tr> <tr> <td>7.107×10^{-5}</td> <td>6.7×10^{-9}</td> <td rowspan="4"></td> <td rowspan="4"></td> </tr> <tr> <td>7.306×10^{-5}</td> <td>5.3×10^{-9}</td> </tr> <tr> <td>7.356×10^{-5}</td> <td>5.4×10^{-9}</td> </tr> <tr> <td>7.887×10^{-5}</td> <td>5.5×10^{-9}</td> </tr> </tbody> </table> <p>The concentration c in the saturated solution was calculated from the measured conductivity κ from the equation</p> $c = \frac{1000\kappa}{\Lambda^{\circ}}$ <p><u>Compiler's note</u> 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, $[\text{SeO}_3^{2-}] = 0.000955M$, $[\text{HSeO}_3^-] = 0.000045M$ and $[\text{OH}^-] = 0.000045M$, 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_{SO} value cannot be regarded as reliable.</p>		Concentration	K_{SO} $\text{mol}^2 \text{dm}^{-6}$	Mean K_{SO} $\text{mol}^2 \text{dm}^{-6}$	$\text{p}K_{\text{SO}}$	8.152×10^{-5}	6.6×10^{-9}	$6.0 \pm 1.1 \times 10^{-9}$	8.22	8.075×10^{-5}	6.5×10^{-9}	7.107×10^{-5}	6.7×10^{-9}			7.306×10^{-5}	5.3×10^{-9}	7.356×10^{-5}	5.4×10^{-9}	7.887×10^{-5}	5.5×10^{-9}
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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 $2 \times 10^{-3} \text{mol dm}^{-3}$. The mean molar conductivity at infinite dilution was found by extrapolation to be $172 \pm 2.9 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$ at 18°C. At that temperature, the ionic conductivity of the lithium ion is $33.4 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$, so the ionic conductivity of the selenite ion is $105.2 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$. The well washed cadmium 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 $\lambda_+ = 90.2 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$.	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: $\pm 0.5 \text{ K}$ Error in K_{SO} (2s) = 1.1×10^{-9} (compiler) REFERENCES: 1. Landolt-Bornstein <i>Physikalisch-Chemische Tabellen II</i> 1923, p. 1105. 2. Monk, C.B. <i>J. Chem. Soc.</i> 1949, 429.																				

COMPONENTS: 1. Cadmium selenite; CdSeO_3 ; [13814-59-0] 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. <i>Zh. Neorg. Khim.</i> 1956, 1, 2300-5; *Russ. <i>J. Inorg. Chem. (Eng. Transl.)</i> 1956, 1, 132-8.																																																				
VARIABLES: HNO_3 and H_2SO_4 concentrations One temperature: 293 K	PREPARED BY: Mary R. Masson																																																				
EXPERIMENTAL VALUES: <p style="text-align: center;">All concentrations are expressed in units of mol dm^{-3}.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Soln.</th> <th style="text-align: center;">Initial pH</th> <th style="text-align: center;">Final pH</th> <th style="text-align: center;">$[\text{Cd}^{2+}]$</th> <th style="text-align: center;">pCd</th> <th style="text-align: center;">$\log \alpha_{\text{L(H)}}$</th> <th style="text-align: center;">$p[\text{SeO}_3^{2-}]$</th> <th style="text-align: center;">pK_{SO}</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: left;">HNO_3</td> <td style="text-align: center;">2.97</td> <td style="text-align: center;">4.86</td> <td style="text-align: center;">1.87×10^{-3}</td> <td style="text-align: center;">2.73</td> <td style="text-align: center;">3.13</td> <td style="text-align: center;">5.86</td> <td style="text-align: center;">8.59</td> </tr> <tr> <td style="text-align: center;">2.27</td> <td style="text-align: center;">3.28</td> <td style="text-align: center;">7.85×10^{-3}</td> <td style="text-align: center;">2.11</td> <td style="text-align: center;">4.77</td> <td style="text-align: center;">6.88</td> <td style="text-align: center;">8.99</td> </tr> <tr> <td style="text-align: center;">2.00</td> <td style="text-align: center;">2.86</td> <td style="text-align: center;">1.52×10^{-2}</td> <td style="text-align: center;">1.82</td> <td style="text-align: center;">5.24</td> <td style="text-align: center;">7.06</td> <td style="text-align: center;">8.88</td> </tr> <tr> <td rowspan="3" style="text-align: left;">H_2SO_4</td> <td style="text-align: center;">2.53</td> <td style="text-align: center;">4.23</td> <td style="text-align: center;">3.03×10^{-3}</td> <td style="text-align: center;">2.52</td> <td style="text-align: center;">3.75</td> <td style="text-align: center;">6.27</td> <td style="text-align: center;">8.79</td> </tr> <tr> <td style="text-align: center;">2.12</td> <td style="text-align: center;">3.02</td> <td style="text-align: center;">9.25×10^{-3}</td> <td style="text-align: center;">2.03</td> <td style="text-align: center;">5.10</td> <td style="text-align: center;">7.13</td> <td style="text-align: center;">9.14</td> </tr> <tr> <td style="text-align: center;">2.03</td> <td style="text-align: center;">2.91</td> <td style="text-align: center;">1.22×10^{-2}</td> <td style="text-align: center;">1.92</td> <td style="text-align: center;">5.17</td> <td style="text-align: center;">7.07</td> <td style="text-align: center;">8.99</td> </tr> </tbody> </table> <p style="text-align: center;">The average value is $K_{\text{SO}} = 1.29 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$. $(pK_{\text{SO}} = 8.89)$</p> <p>Notes. $[\text{Se}_{\text{tot}}] = [\text{Cd}^{2+}]$ and $[\text{SeO}_3^{2-}] = [\text{Se}_{\text{tot}}]/\alpha_{\text{L(H)}}$ where $\alpha_{\text{L(H)}} = (1 + [\text{H}^+]/K_2 + [\text{H}^+]^2/K_1K_2)$ and the acid dissociation constants have the values $K_1 = 4 \times 10^{-3}$ and $K_2 = 1.0 \times 10^{-8}$ (ref. 1).</p>		Soln.	Initial pH	Final pH	$[\text{Cd}^{2+}]$	pCd	$\log \alpha_{\text{L(H)}}$	$p[\text{SeO}_3^{2-}]$	pK_{SO}	HNO_3	2.97	4.86	1.87×10^{-3}	2.73	3.13	5.86	8.59	2.27	3.28	7.85×10^{-3}	2.11	4.77	6.88	8.99	2.00	2.86	1.52×10^{-2}	1.82	5.24	7.06	8.88	H_2SO_4	2.53	4.23	3.03×10^{-3}	2.52	3.75	6.27	8.79	2.12	3.02	9.25×10^{-3}	2.03	5.10	7.13	9.14	2.03	2.91	1.22×10^{-2}	1.92	5.17	7.07	8.99
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METHOD APPARATUS/PROCEDURE: Solutions of nitric and sulfuric acids were saturated with cadmium 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 cadmium concentration was determined (method not stated).	SOURCE AND PURITY OF MATERIALS: C.P.-grade reagents were used. Cadmium selenite was prepared by mixing 0.1N sodium selenite solution with a stoichiometric amount of 3% cadmium chloride solution. The precipitate was removed by centrifugation and dried at 40°C. Cadmium was determined gravimetrically as the sulfate, and selenium gravimetrically as the element.																																																				
ESTIMATED ERROR: The spread in the results is 0.55 of a log unit. Temperature: probably ± 0.05 K																																																					
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VARIABLES: One temperature, probably 293 or 298 K	PREPARED BY: Mary R. Masson
EXPERIMENTAL VALUES: <p>A solution in contact with a precipitate of CdSeO_3 was found to contain $2.35 \times 10^{-5} \text{ mol dm}^{-3}$ cadmium(II) and $1.70 \times 10^{-3} \text{ mol dm}^{-3}$ total selenite at pH 6.0. A value for the solubility product can be calculated as follows (compiler). At pH 6.0, $\log \alpha_{\text{L}(\text{H})} = 2.00$ when $K_1 = 4 \times 10^{-3}$, $K_2 = 1 \times 10^{-8}$ (ref. 1). Then, since $[\text{SeO}_3^{2-}] = [\text{Se}_{\text{tot}}]/\alpha_{\text{L}(\text{H})} = 1.7 \times 10^{-5}$, and $[\text{Cd}^{2+}] = 2.35 \times 10^{-5} \text{ mol dm}^{-3}$, $K_{\text{SO}} = 4.0 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$, and $\text{p}K_{\text{SO}} = 9.40$. The temperature of the determination is not stated.</p>	
AUXILIARY INFORMATION	
METHOD APPARATUS/PROCEDURE: The filtrate after precipitation of cadmium selenite was analysed for cadmium with dithizone, and for selenite with 3,3'-diaminobenzidine.	SOURCE AND PURITY OF MATERIALS: Not stated. ESTIMATED ERROR: Errors of $\pm 1\%$ in determination of Cd^{2+} and selenite, and of ± 0.1 pH unit would cause an error of $\pm 1.0 \times 10^{-10}$ in K_{SO} . (± 0.12 in $\text{p}K_{\text{SO}}$). REFERENCES: 1. Rumpf, P. <i>Compt. Rendu</i> <u>1933</u> , 197, 686.