

<b>COMPONENTS:</b> 1. Barium selenite; BaSeO <sub>3</sub> ; [13718-59-7] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Ripan, R.; Vericeanu, G. <i>Studia Univ. Babes-Bolyai, Ser. Chim.</i> <u>1968</u> , 13, 31-37.																				
<b>VARIABLES:</b> One temperature: 291 K	<b>PREPARED BY:</b> Mary R. Masson																				
<b>EXPERIMENTAL VALUES:</b> All concentrations are expressed in units of mol dm <sup>-3</sup> . <table border="1" data-bbox="319 486 1099 711"> <thead> <tr> <th>Concentration</th> <th><math>K_{sO}</math> mol<sup>2</sup> dm<sup>-6</sup></th> <th>Mean <math>K_{sO}</math> mol<sup>2</sup> dm<sup>-6</sup></th> <th><math>pK_{sO}</math></th> </tr> </thead> <tbody> <tr> <td>7.661 x 10<sup>-4</sup></td> <td>5.3 x 10<sup>-7</sup></td> <td rowspan="2">6.2 ± 1.2 x 10<sup>-6</sup></td> <td rowspan="2">6.21</td> </tr> <tr> <td>7.711 x 10<sup>-4</sup></td> <td>6.0 x 10<sup>-7</sup></td> </tr> <tr> <td>7.612 x 10<sup>-4</sup></td> <td>5.8 x 10<sup>-7</sup></td> <td rowspan="4">6.2 ± 1.2 x 10<sup>-6</sup></td> <td rowspan="4">6.21</td> </tr> <tr> <td>8.086 x 10<sup>-4</sup></td> <td>6.5 x 10<sup>-7</sup></td> </tr> <tr> <td>8.230 x 10<sup>-4</sup></td> <td>6.8 x 10<sup>-7</sup></td> </tr> <tr> <td>8.190 x 10<sup>-4</sup></td> <td>6.7 x 10<sup>-7</sup></td> </tr> </tbody> </table> <p>The concentration <math>c</math> in the saturated solution was calculated from the measured conductivity <math>\kappa</math> from the equation</p> $c = \frac{1000\kappa}{\Lambda^{\circ}}$ <p><b>Compiler's note</b>            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<sub>3</sub><sup>2-</sup>] = 0.000955M, [HSeO<sub>3</sub><sup>-</sup>] = 0.000045M and [OH<sup>-</sup>] = 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 <math>K_{sO}</math> value cannot be regarded as reliable.</p>		Concentration	$K_{sO}$ mol <sup>2</sup> dm <sup>-6</sup>	Mean $K_{sO}$ mol <sup>2</sup> dm <sup>-6</sup>	$pK_{sO}$	7.661 x 10 <sup>-4</sup>	5.3 x 10 <sup>-7</sup>	6.2 ± 1.2 x 10 <sup>-6</sup>	6.21	7.711 x 10 <sup>-4</sup>	6.0 x 10 <sup>-7</sup>	7.612 x 10 <sup>-4</sup>	5.8 x 10 <sup>-7</sup>	6.2 ± 1.2 x 10 <sup>-6</sup>	6.21	8.086 x 10 <sup>-4</sup>	6.5 x 10 <sup>-7</sup>	8.230 x 10 <sup>-4</sup>	6.8 x 10 <sup>-7</sup>	8.190 x 10 <sup>-4</sup>	6.7 x 10 <sup>-7</sup>
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<b>METHOD APPARATUS/PROCEDURE:</b> 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 x 10 <sup>-3</sup> mol dm <sup>-3</sup> . The mean molar conductivity at infinite dilution was found by extrapolation to be 172 ± 2.9 Ω <sup>-1</sup> cm <sup>2</sup> mol <sup>-1</sup> at 18°C. At that temperature, the ionic conductivity of the lithium ion is 33.4 Ω <sup>-1</sup> cm <sup>2</sup> mol <sup>-1</sup> , so the ionic conductivity of the selenite ion is 105.2 Ω <sup>-1</sup> cm <sup>2</sup> mol <sup>-1</sup> . The well washed barium 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 $\lambda_{+} = 110$ Ω <sup>-1</sup> cm <sup>2</sup> mol <sup>-1</sup> .	<b>SOURCE AND PURITY OF MATERIALS:</b> 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.  <b>ESTIMATED ERROR:</b> Temperature: ±0.5 K Error in $K_{sO}$ (2s) = 1.2 x 10 <sup>-6</sup> (compiler)  <b>REFERENCES:</b> 1. Landolt-Bornstein <i>Physikalisch-Chemische Tabellen II</i> 1923, p. 1105. 2. Monk, C.B. <i>J. Chem. Soc.</i> 1949, 429.																				

<b>COMPONENTS:</b>  1. Barium selenite; BaSeO <sub>3</sub> ; [13718-59-7] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b>  Leschinskaya, Z.I.; Averbukh, M.A.; Selivanova, N.M.  <i>Zh. Fiz. Khim.</i> <u>1965</u> , 39, 2036-8; *Russ. <i>J. Phys. Chem.</i> <u>1965</u> , 39, 1082-3.																																								
<b>VARIABLES:</b>  One temperature: 298 K	<b>PREPARED BY:</b>  Mary R. Masson																																								
<b>EXPERIMENTAL VALUES:</b>  All concentrations are expressed in units of mol dm <sup>-3</sup> at 25°C. <table border="1" data-bbox="111 524 1245 806"> <thead> <tr> <th>Time of mixing (days) at 25°C</th> <th>Concentration of Ba<sup>2+</sup></th> <th>K<sub>sO</sub>, (authors) mol<sup>2</sup> dm<sup>-6</sup></th> <th>Concentration of SeO<sub>3</sub><sup>2-</sup></th> <th>K<sub>sO</sub> (compiler) mol<sup>2</sup> dm<sup>-6</sup></th> </tr> </thead> <tbody> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>5.82 x 10<sup>-4</sup></td> <td></td> <td>5.48 x 10<sup>-4</sup></td> <td></td> </tr> <tr> <td>9</td> <td>6.06 x 10<sup>-4</sup></td> <td></td> <td>5.71 x 10<sup>-4</sup></td> <td></td> </tr> <tr> <td>12</td> <td>6.25 x 10<sup>-4</sup></td> <td></td> <td>5.90 x 10<sup>-4</sup></td> <td></td> </tr> <tr> <td>15</td> <td>6.53 x 10<sup>-4</sup></td> <td></td> <td>6.17 x 10<sup>-4</sup></td> <td></td> </tr> <tr> <td>21</td> <td>6.59 x 10<sup>-4</sup></td> <td></td> <td>6.23 x 10<sup>-4</sup></td> <td></td> </tr> <tr> <td>Mean</td> <td>6.56 x 10<sup>-4</sup></td> <td>4.30 x 10<sup>-7</sup> pK<sub>sO</sub> = 6.37</td> <td>6.20 x 10<sup>-4</sup></td> <td>4.07 x 10<sup>-7</sup> pK<sub>sO</sub> = 6.39</td> </tr> </tbody> </table> <p>In their calculations, the authors omitted to allow for hydrolysis of the selenite ion. The compiler recalculated the results to take account of this, making use of the program HALTAFALL (1). The dissociation constant values were those of Hagiwara (2), namely K<sub>a1</sub> = 10<sup>-2.62</sup> mol dm<sup>-3</sup> and K<sub>a2</sub> = 10<sup>-8.32</sup> mol dm<sup>-3</sup>. For this system, the neglect of hydrolysis did not have a great influence on the results.</p>		Time of mixing (days) at 25°C	Concentration of Ba <sup>2+</sup>	K <sub>sO</sub> , (authors) mol <sup>2</sup> dm <sup>-6</sup>	Concentration of SeO <sub>3</sub> <sup>2-</sup>	K <sub>sO</sub> (compiler) mol <sup>2</sup> dm <sup>-6</sup>	3					5	5.82 x 10 <sup>-4</sup>		5.48 x 10 <sup>-4</sup>		9	6.06 x 10 <sup>-4</sup>		5.71 x 10 <sup>-4</sup>		12	6.25 x 10 <sup>-4</sup>		5.90 x 10 <sup>-4</sup>		15	6.53 x 10 <sup>-4</sup>		6.17 x 10 <sup>-4</sup>		21	6.59 x 10 <sup>-4</sup>		6.23 x 10 <sup>-4</sup>		Mean	6.56 x 10 <sup>-4</sup>	4.30 x 10 <sup>-7</sup> pK <sub>sO</sub> = 6.37	6.20 x 10 <sup>-4</sup>	4.07 x 10 <sup>-7</sup> pK <sub>sO</sub> = 6.39
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<b>METHOD APPARATUS/PROCEDURE:</b> Solid barium selenite was equilibrated with water for 18 -20 days, in a thermostat at 25°C. The saturated solution was filtered through a glass filter, then the concn. of barium was determined by flame spectrophotometry, with an experimental error of 1.0 - 1.5% of the quantity measured.	<b>SOURCE AND PURITY OF MATERIALS:</b> Barium selenite was prepared by the reaction of stoichiometric amounts of barium chloride and sodium selenite at 25°C.  <b>ESTIMATED ERROR:</b> Error in temperature probably ±0.1 K (cf. ref. 3). Error in K <sub>sO</sub> (2s) = ±0.09 x 10 <sup>-7</sup> (based on results for days 15 - 21).  <b>REFERENCES:</b> 1. Ingri, N.; Kakolowicz, W.; Sillén, L.G.; Warnqvist, B. <i>Talanta</i> <u>1967</u> , 14, 1261. 2. Hagiwara, H. <i>Bull. Inst. Phys. Chem. Res., Tokyo</i> <u>1939</u> , 18, 648. 3. Selivanova, N.M.; Leschinskaya, Z.I.; Klushina, T.V. <i>Zh. Fiz. Khim.</i> <u>1962</u> , 36, 1349.																																								

<b>COMPONENTS:</b> 1. Barium selenite; BaSeO <sub>3</sub> ; [13718-59-7] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Dolique, R. <i>Bull. Soc. Chim. France</i> <u>1943</u> , 10, M50.
<b>VARIABLES:</b> One temperature: 283 K	<b>PREPARED BY:</b> Mary R. Masson
<b>EXPERIMENTAL VALUES:</b> <p>The author found the solubility of barium selenite in water to be 9.53 mg/100 ml after 9 days, 13.75 mg/100 ml after 26 days, and 17.63 mg after 39 days.</p> <p>The concentration after 39 days can be expressed as <math>6.67 \times 10^{-4} \text{ mol dm}^{-3}</math>; this would give a value of <math>4.45 \times 10^{-7} \text{ mol}^2 \text{ dm}^{-6}</math> for <math>K_{s0}</math> (<math>\text{p}K_{s0} = 6.35</math>), if hydrolysis is neglected. The temperature of the determination was 10°C.</p>	
<b>AUXILIARY INFORMATION</b>	
<b>METHOD APPARATUS/PROCEDURE:</b> The barium selenite was agitated in water for the time given above. The concentration of selenium in solution was then determined by a method developed by Dolique, Perahia and Roca.	<b>SOURCE AND PURITY OF MATERIALS:</b> Barium selenite was prepared by the traditional method of "double decomposition", thoroughly washed, but not dried.  <b>ESTIMATED ERROR:</b> Temperature: $\pm 1 \text{ K}$ Solubility: no estimate available.  <b>REFERENCES:</b>

<p><b>COMPONENTS:</b></p> <ol style="list-style-type: none"> <li>Barium selenite; BaSeO<sub>3</sub>; [13718-59-7]</li> <li>Selenium dioxide; SeO<sub>2</sub>; [7446-08-4]</li> <li>Water; H<sub>2</sub>O; [7732-18-5]</li> </ol>	<p><b>ORIGINAL MEASUREMENTS:</b></p> <p>Neal, J.L., Jr.; McCrosky, C.R.  <i>J. Am. Chem. Soc.</i> <u>1938</u>, 60, 911-4.</p>
<p><b>VARIABLES:</b></p> <p>Concentrations of the components                  Three temperatures</p>	<p><b>PREPARED BY:</b></p> <p>Mary R. Masson</p>

<p><b>EXPERIMENTAL VALUES:</b></p> <table border="1"> <thead> <tr> <th>SeO<sub>2</sub></th> <th>BaSeO<sub>3</sub></th> <th>SeO<sub>2</sub><sup>a</sup></th> <th>BaSeO<sub>3</sub><sup>a</sup></th> <th>Solid<sup>b</sup></th> </tr> <tr> <th>mass %</th> <th>mass %</th> <th>mol/kg</th> <th>mol/kg</th> <th>phase</th> </tr> </thead> <tbody> <tr><td colspan="5"><b>Temperature = 0°C</b></td></tr> <tr><td>58.9</td><td>0.00</td><td>12.915</td><td>0.</td><td>A</td></tr> <tr><td>58.8</td><td>1.24</td><td>13.261</td><td>0.117</td><td>A</td></tr> <tr><td>58.7</td><td>2.51</td><td>13.638</td><td>0.245</td><td>A</td></tr> <tr><td>58.7</td><td>3.51</td><td>13.999</td><td>0.351</td><td>A + P</td></tr> <tr><td>58.6</td><td>3.54</td><td>13.949</td><td>0.354</td><td>A + P</td></tr> <tr><td>58.6</td><td>3.53</td><td>13.946</td><td>0.353</td><td>A + P</td></tr> <tr><td>58.7</td><td>3.51</td><td>13.999</td><td>0.351</td><td>A + P</td></tr> <tr><td>57.8</td><td>3.42</td><td>13.432</td><td>0.334</td><td>P</td></tr> <tr><td>52.8</td><td>2.77</td><td>10.710</td><td>0.236</td><td>P</td></tr> <tr><td>49.7</td><td>2.44</td><td>9.359</td><td>0.193</td><td>P</td></tr> <tr><td>44.3</td><td>1.99</td><td>7.433</td><td>0.140</td><td>P</td></tr> <tr><td>35.6</td><td>1.44</td><td>5.096</td><td>0.087</td><td>P</td></tr> <tr><td>30.6</td><td>1.18</td><td>4.042</td><td>0.065</td><td>P</td></tr> <tr><td>26.6</td><td>1.10</td><td>3.316</td><td>0.058</td><td>P</td></tr> <tr><td>17.9</td><td>0.89</td><td>1.986</td><td>0.041</td><td>P</td></tr> <tr><td>8.80</td><td>0.69</td><td>0.876</td><td>0.029</td><td>P</td></tr> <tr><td>4.57</td><td>0.58</td><td>0.434</td><td>0.023</td><td>P</td></tr> <tr><td>2.04</td><td>0.58</td><td>0.189</td><td>0.023</td><td>P</td></tr> <tr><td>1.11</td><td>0.65</td><td>0.102</td><td>0.025</td><td>P</td></tr> <tr><td>0.28</td><td>0.64</td><td>0.025</td><td>0.024</td><td>P</td></tr> <tr><td>0.27</td><td>0.64</td><td>0.025</td><td>0.024</td><td>P + N</td></tr> <tr><td>0.17</td><td>0.39</td><td>0.015</td><td>0.015</td><td>N</td></tr> <tr><td>0.00</td><td>0.005</td><td>0.</td><td>0.000</td><td>N</td></tr> </tbody> </table>	SeO <sub>2</sub>	BaSeO <sub>3</sub>	SeO <sub>2</sub> <sup>a</sup>	BaSeO <sub>3</sub> <sup>a</sup>	Solid <sup>b</sup>	mass %	mass %	mol/kg	mol/kg	phase	<b>Temperature = 0°C</b>					58.9	0.00	12.915	0.	A	58.8	1.24	13.261	0.117	A	58.7	2.51	13.638	0.245	A	58.7	3.51	13.999	0.351	A + P	58.6	3.54	13.949	0.354	A + P	58.6	3.53	13.946	0.353	A + P	58.7	3.51	13.999	0.351	A + P	57.8	3.42	13.432	0.334	P	52.8	2.77	10.710	0.236	P	49.7	2.44	9.359	0.193	P	44.3	1.99	7.433	0.140	P	35.6	1.44	5.096	0.087	P	30.6	1.18	4.042	0.065	P	26.6	1.10	3.316	0.058	P	17.9	0.89	1.986	0.041	P	8.80	0.69	0.876	0.029	P	4.57	0.58	0.434	0.023	P	2.04	0.58	0.189	0.023	P	1.11	0.65	0.102	0.025	P	0.28	0.64	0.025	0.024	P	0.27	0.64	0.025	0.024	P + N	0.17	0.39	0.015	0.015	N	0.00	0.005	0.	0.000	N	<p>Composition of equilibrium solutions</p> <p>(continued on next page)</p>
SeO <sub>2</sub>	BaSeO <sub>3</sub>	SeO <sub>2</sub> <sup>a</sup>	BaSeO <sub>3</sub> <sup>a</sup>	Solid <sup>b</sup>																																																																																																																															
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**AUXILIARY INFORMATION**

<p><b>METHOD APPARATUS/PROCEDURE:</b></p> <p>Weighed amounts of solids, slightly more than necessary to saturate the proposed amount of solution, were placed in a sample bottle and a measured volume of water was added. The sealed bottles, kept in a thermostat, were shaken by hand at frequent intervals. Samples were taken at intervals of from 3 - 14 days, depending on the rate of attainment of saturation, which was slowest for the most dilute solutions. Samples were removed by pipettes, through filters, transferred to tared 100-ml standard flasks, then weighed and diluted to the mark with water. In portions removed by pipette, barium was determined by precipitation as the sulfate, and total selenious acid by the method of Coleman and McCrosky (1). The remaining solid phase was examined by microscope or by X-ray diffraction to determine its nature.</p>	<p><b>SOURCE AND PURITY OF MATERIALS:</b></p> <p>Barium selenite: barium carbonate was dissolved in nitric acid, and the salt was recrystallized several times. The purified nitrate was treated with a slight excess of selenious acid, then the selenite was precipitated by addition of ammonia, washed free of ammonia, and dried.</p> <p>Selenious acid: selenium dioxide was prepared by oxidation of black selenium and purified by sublimation. This was dissolved in the minimum of hot water. Crystals separated on cooling and inoculation.</p> <p>Barium pyroselenite: the normal selenite was digested with an excess of selenious acid at 50°C for several weeks to ensure complete conversion.</p>
<p><b>ESTIMATED ERROR:</b></p> <p>Temperature was controlled to ±0.1 K                  The maximum deviations from the mean compositions found were 0.1% in 3.5% for barium selenite and 0.25% in 75% for H<sub>2</sub>SeO<sub>3</sub>.</p>	<p><b>REFERENCES:</b></p> <ol style="list-style-type: none"> <li>Coleman, W.C.; McCrosky, C.R. <i>Ind. Eng. Chem., Anal. Ed.</i> <u>1937</u>, 9, 431.</li> </ol>

## COMPONENTS:

1. Barium selenite;  $\text{BaSeO}_3$ ; [13718-59-7]
2. Selenium dioxide;  $\text{SeO}_2$ ; [7446-08-4]
3. Water;  $\text{H}_2\text{O}$ ; [7732-18-5]

## ORIGINAL MEASUREMENTS:

Neal, J.L., Jr.; McCrosky, C.R.  
*J. Am. Chem. Soc.* 1938, *60*, 911-4.

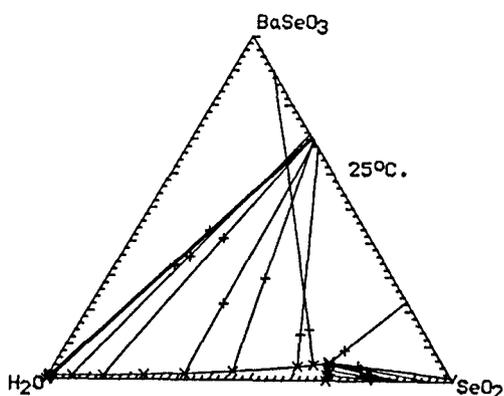
## EXPERIMENTAL VALUES (continued):

## Composition of equilibrium solutions

$\text{SeO}_2$	$\text{BaSeO}_3$	$\text{SeO}_2^a$	$\text{BaSeO}_3^a$	Solid <sup>b</sup>
mass %	mass %	mol/kg	mol/kg	phase

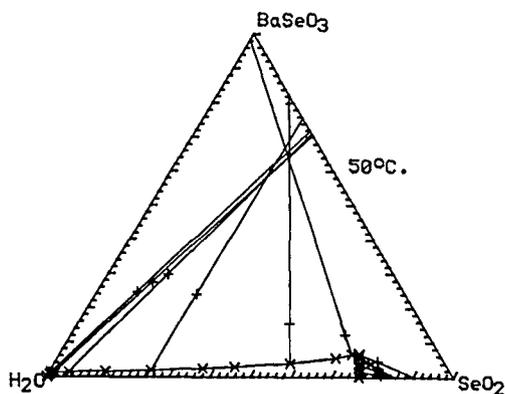
Temperature = 25°C

68.8	0.00	19.873	0.	A
68.3	1.54	20.409	0.193	A
67.7	3.13	20.916	0.406	A
67.3	4.61	21.592	0.621	A
67.2	5.03	21.809	0.685	A + P
67.1	5.12	21.768	0.697	A + P
67.2	5.04	21.816	0.687	A + P
63.6	4.36	17.889	0.515	P
59.9	3.84	14.888	0.401	P
44.7	2.42	7.618	0.173	P
33.2	1.74	4.599	0.101	P
23.3	1.33	2.786	0.067	P
13.5	1.09	1.424	0.048	P
5.94	0.97	0.575	0.039	P
1.27	0.96	0.117	0.037	P
0.41	0.95	0.037	0.036	P
0.42	0.97	0.038	0.037	P + N
0.25	0.58	0.023	0.022	N
0.00	0.005	0.	0.000	N



Temperature = 50°C

76.6	0.00	29.502	0.	A
76.2	1.51	30.809	0.256	A
75.4	2.75	31.100	0.476	A
74.8	3.66	31.296	0.643	A
73.8	5.80	32.603	1.076	A
73.5	6.67	33.404	1.273	A + P
73.4	6.59	33.058	1.246	A + P
71.8	6.42	29.710	1.115	P
68.3	5.32	23.333	0.763	P
57.8	3.90	13.601	0.385	P
44.7	2.81	7.675	0.203	P
37.1	2.38	5.525	0.149	P
24.7	1.80	3.029	0.093	P
13.7	1.45	1.455	0.065	P
4.87	1.28	0.468	0.052	P
1.34	1.16	0.124	0.045	P
0.51	1.18	0.047	0.045	P
0.52	1.18	0.048	0.045	P + N
0.29	0.67	0.026	0.026	N
0.00	0.005	0.	0.000	N



<sup>a</sup> Molalities calculated by the compiler.

<sup>b</sup> Solid phases: A -  $\text{H}_2\text{SeO}_3$ , P -  $\text{BaSe}_2\text{O}_5$ , N -  $\text{BaSeO}_3$