

<p>COMPONENTS:</p> <ol style="list-style-type: none"> <li>1. Barium sulfite; BaSO<sub>3</sub>; [7787-39-5]</li> <li>2. Water; H<sub>2</sub>O; [7732-18-5]</li> </ol>	<p>EVALUATOR:</p> <p>H.D. Lutz, Dept. of Chemistry, University of Siegen, FR Germany.</p> <p>August 1983.</p>
<p>CRITICAL EVALUATION:</p> <p>Barium sulfite crystallizes from aqueous solutions in the form of the anhydrous salt, BaSO<sub>3</sub>. The solubility of BaSO<sub>3</sub> in water has not yet been thoroughly investigated. Numerical data have been reported by Autenrieth <i>et al.</i> (1), Rogowicz (2), Parsons (3), Mareček <i>et al.</i> (4), Rodin <i>et al.</i> (5), and Cohen <i>et al.</i> (6), yet not under directly comparable experimental conditions. In 1898, Autenrieth <i>et al.</i> (1) reported the value of 0.022 g/kg H<sub>2</sub>O (<math>m(\text{BaSO}_3) = 1.0 \times 10^{-4} \text{ mol kg}^{-1}</math>) at 289 K. Rogowicz (2) gave the values 0.1974 and 0.0177 g/dm<sup>3</sup> (<math>c(\text{BaSO}_3) = 9.080 \times 10^{-4}</math> and <math>8.14 \times 10^{-5} \text{ mol dm}^{-3}</math>) at 293 and 353 K, respectively. Parsons (3) reported the solubility product of BaSO<sub>3</sub> (<math>K_{s0}</math>) as <math>9.5 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}</math> at 298.2 K from a source which is not given nor could be traced. This value is equivalent to a solubility of 6.7 mg/dm<sup>3</sup> (<math>c(\text{BaSO}_3) = 3.08 \times 10^{-5} \text{ mol dm}^{-3}</math>). In 1983 Rodin <i>et al.</i> (5) determined some values from <math>1.23 \times 10^{-3} \text{ g/dm}^3</math> (<math>c(\text{BaSO}_3) = 5.7 \times 10^{-6} \text{ mol dm}^{-3}</math>) at 293 K to <math>3.5 \times 10^{-3} \text{ g/dm}^3</math> (<math>1.61 \times 10^{-5} \text{ mol dm}^{-3}</math>) at 353 K. Cohen <i>et al.</i> (6) reported that the amount of dissolved barium sulfite in solutions containing 0.7 mol dm<sup>-3</sup> NaCl and rapidly precipitated BaSO<sub>3</sub> at 298 K decreases from <math>3.0 \times 10^{-4}</math> to <math>2.3 \times 10^{-4} \text{ mol kg}^{-1}</math> (molality) within 24 hr. The change in the solubility is attributed to a phase transition of the precipitated barium sulfite. In 1970, Mareček <i>et al.</i> (4) determined the activity solubility product from equilibrium studies of the reaction <math>\text{BaSO}_3(\text{s}) + \text{CO}_3^{2-} \rightleftharpoons \text{BaCO}_3(\text{s}) + \text{SO}_3^{2-}</math> as <math>4.9 \times 10^{-10} \text{ mol}^2 \text{ kg}^{-2}</math> (molality scale) at 298.2 K.</p> <p>The value of Mareček <i>et al.</i> (4) appears to be the most reliable solubility value with respect to the activity of Ba<sup>2+</sup> (aq) and SO<sub>3</sub><sup>2-</sup> (aq) at the present time. The total amount of dissolved barium sulfite including the undissociated BaSO<sub>3</sub> seems to be greater than that of Mareček <i>et al.</i> (4) and is probably approximately the same as the values given by Autenrieth <i>et al.</i> (1) and Parsons (3). The scarce information on the temperature shift in the solubility of BaSO<sub>3</sub> is contradictory. A negative temperature coefficient of the solubility is reported by Rogowicz (2), a positive temperature coefficient by Rodin <i>et al.</i> (5).</p> <p>TENTATIVE VALUES</p> <p>The solubility of BaSO<sub>3</sub> in water at room temperature is approximately <math>5 \times 10^{-5} \text{ mol kg}^{-1}</math> (0.01 g/kg H<sub>2</sub>O). The solubility product, based on the activities, is <math>5 \times 10^{-10} \text{ mol}^2 \text{ kg}^{-2}</math> (molality scale). The temperature coefficient of solubility is positive.</p> <p>The solubility of barium sulfite in water is affected by the presence of a third component. This becomes evident by fragmentary experimental data on the ternary systems BaSO<sub>3</sub>-SO<sub>2</sub>-H<sub>2</sub>O (7,8), BaSO<sub>3</sub>-sucrose-H<sub>2</sub>O (2,9), and BaSO<sub>3</sub>-ethanol-H<sub>2</sub>O (10). The solubility of BaSO<sub>3</sub> increases by about 10<sup>3</sup> with increasing SO<sub>2</sub> content (7,8) and decreases with increasing sucrose (2,9) and ethanol (10) content. In acids BaSO<sub>3</sub> is readily dissolved, but undergoes decomposition.</p>	

<b>COMPONENTS:</b>  1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>EVALUATOR:</b>  H.D. Lutz, Dept. of Chemistry, University of Siegen, FR Germany.  August 1983.
<b>CRITICAL EVALUATION:</b> (continued)  <b>REFERENCES</b>  1. Autenrieth, W.; Windaus, A. <i>Z. Anal. Chem.</i> <u>1898</u> , 37, 290. 2. Rogowicz, J. <i>Z. Ver. Dtsch. Zucker-Ind., Allg. Teil</i> <u>1905</u> , 938. 3. Parsons, R. <i>Handbook of Electrochemical Constants</i> , Academic Press, London, <u>1959</u> , p. 56. 4. Mareček, J.; Erdős, E. <i>Collect. Czech. Chem. Commun.</i> <u>1970</u> , 35, 1017. 5. Rodin, I.V.; Margulis, E.V. <i>Zh. Neorg. Khim.</i> <u>1983</u> , 28, 255; <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1983</u> , 28, 142. 6. Cohen, A.; Zangen, M.; Goldschmidt, J.M.E. <i>Rev. Chim. Miner.</i> <u>1981</u> , 18, 142. 7. Simon, A.; Waldmann, K. <i>Naturwissenschaften</i> <u>1958</u> , 45, 128. 8. Conrad, F.H.; Beuschlein, W.L. <i>J. Am. Chem. Soc.</i> <u>1934</u> , 56, 2554. 9. Geese, J.W. <i>Z. Ver. Dtsch. Zucker-Ind., Allg. Teil</i> <u>1898</u> , 48, 99. 10. Arnal, T.G.; Mesorana, J.M.P. <i>An. Fis. Quim.</i> <u>1947</u> , 43, 439.	

<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Autenrieth, W.; Windaus, A. <i>Z. Anal. Chem.</i> <u>1898</u> , 37, 290-300.
<b>VARIABLES:</b> One temperature: 289 K	<b>PREPARED BY:</b> H.D. Lutz
<b>EXPERIMENTAL VALUES:</b> The solubility of barium sulfite in water at 16°C is 1 part of BaSO <sub>3</sub> per 46 000 parts of water. This value is equal to (compiler) $2.2 \times 10^{-2}$ g BaSO <sub>3</sub> /kg H <sub>2</sub> O or $m(\text{BaSO}_3) = 1.0 \times 10^{-4}$ mol kg <sup>-1</sup> .	
<b>AUXILIARY INFORMATION</b>	
<b>METHOD APPARATUS/PROCEDURE:</b> Saturation method. Equilibrium was established, with frequent shaking, after several days. The sulfite content of the saturated solution was determined iodometrically.	<b>SOURCE AND PURITY OF MATERIALS:</b> BaSO <sub>3</sub> was precipitated from a solution of barium chloride with Na <sub>2</sub> SO <sub>3</sub> and washed carefully with distilled water.  <b>ESTIMATED ERROR:</b>  <b>REFERENCES:</b>

<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Rodin, I.V.; Margulis, E.V. <i>Zh. Neorg. Khim.</i> <u>1983</u> , 28, 255; <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1983</u> , 28, 142.																									
<b>VARIABLES:</b> Four temperatures: 293 - 363 K	<b>PREPARED BY:</b> B. Engelen																									
<b>EXPERIMENTAL VALUES:</b> <p>The solubilities of barium sulfite in water at various temperatures are reported. The solubility products are defined as <math>K_{s0}(\text{BaSO}_3) = [\text{Ba}^{2+}]^2</math>.</p> <table border="1" data-bbox="246 584 1097 786"> <thead> <tr> <th>t/°C</th> <th>Ba mg/dm<sup>3</sup></th> <th>BaSO<sub>3</sub> mg/dm<sup>3a</sup></th> <th>10<sup>5</sup>c/mol dm<sup>-3</sup></th> <th>10<sup>11</sup>K<sub>s0</sub> mol<sup>2</sup> dm<sup>-6</sup></th> </tr> </thead> <tbody> <tr> <td>20</td> <td>0.78</td> <td>1.23</td> <td>0.57</td> <td>3.25</td> </tr> <tr> <td>50</td> <td>1.19</td> <td>1.88</td> <td>0.87</td> <td>7.57</td> </tr> <tr> <td>70</td> <td>1.62</td> <td>2.56</td> <td>1.18</td> <td>13.9</td> </tr> <tr> <td>80</td> <td>2.21</td> <td>3.50</td> <td>1.61</td> <td>25.9</td> </tr> </tbody> </table> <p><sup>a</sup> Calculated by the compiler.</p>		t/°C	Ba mg/dm <sup>3</sup>	BaSO <sub>3</sub> mg/dm <sup>3a</sup>	10 <sup>5</sup> c/mol dm <sup>-3</sup>	10 <sup>11</sup> K <sub>s0</sub> mol <sup>2</sup> dm <sup>-6</sup>	20	0.78	1.23	0.57	3.25	50	1.19	1.88	0.87	7.57	70	1.62	2.56	1.18	13.9	80	2.21	3.50	1.61	25.9
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<b>METHOD APPARATUS/PROCEDURE:</b> Saturation method. Equilibrium was established by stirring the saturated solution in thermostatically controlled glass tubes. Equilibrium was tested for analytically - 3 hr is reported to be sufficient. Barium was determined gravimetrically.	<b>SOURCE AND PURITY OF MATERIALS:</b> Barium sulfite was precipitated from BaCl <sub>2</sub> solutions with Na <sub>2</sub> SO <sub>3</sub> .  <b>ESTIMATED ERROR:</b> Temperature: ±0.5 K.  <b>REFERENCES:</b>																									

<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Sucrose; C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> ; [50-99-7] 3. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Rogowicz, J. <i>Z. Ver. Dtsch. Zucker-Ind.. Allg. Teil</i> <u>1905</u> , 938.																																												
<b>VARIABLES:</b> Two temperatures: 293 and 353 K	<b>PREPARED BY:</b> H.D. Lutz																																												
<b>EXPERIMENTAL VALUES:</b> <p style="text-align: center;">Composition of saturated solution</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sucrose mass %</th> <th colspan="2">g BaSO<sub>3</sub>/100 cm<sup>3</sup></th> <th colspan="2">10<sup>3</sup>c(BaSO<sub>3</sub>)/mol dm<sup>-3a</sup></th> </tr> <tr> <th>20°C</th> <th>80°C</th> <th>20°C</th> <th>80°C</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.01974</td> <td>0.00177</td> <td>0.9080</td> <td>0.0814</td> </tr> <tr> <td>10</td> <td>0.01040</td> <td>0.00335</td> <td>0.4784</td> <td>0.1541</td> </tr> <tr> <td>20</td> <td>0.00968</td> <td>0.00289</td> <td>0.4453</td> <td>0.1329</td> </tr> <tr> <td>30</td> <td>0.00782</td> <td>0.00223</td> <td>0.3597</td> <td>0.1026</td> </tr> <tr> <td>40</td> <td>0.00484</td> <td>0.00158</td> <td>0.2226</td> <td>0.0727</td> </tr> <tr> <td>50</td> <td>0.00298</td> <td>0.00149</td> <td>0.1371</td> <td>0.0685</td> </tr> <tr> <td>66 (saturated soln.)</td> <td>0.00223</td> <td>0.00112</td> <td>0.1026</td> <td>0.0515</td> </tr> </tbody> </table> <p><sup>a</sup> Calculated by the compiler.</p>		Sucrose mass %	g BaSO <sub>3</sub> /100 cm <sup>3</sup>		10 <sup>3</sup> c(BaSO <sub>3</sub> )/mol dm <sup>-3a</sup>		20°C	80°C	20°C	80°C	0	0.01974	0.00177	0.9080	0.0814	10	0.01040	0.00335	0.4784	0.1541	20	0.00968	0.00289	0.4453	0.1329	30	0.00782	0.00223	0.3597	0.1026	40	0.00484	0.00158	0.2226	0.0727	50	0.00298	0.00149	0.1371	0.0685	66 (saturated soln.)	0.00223	0.00112	0.1026	0.0515
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<b>METHOD APPARATUS/PROCEDURE:</b> Saturation method. Sulfite was determined iodometrically, barium gravimetrically as BaSO <sub>4</sub> .	<b>SOURCE AND PURITY OF MATERIALS:</b> Barium sulfite was precipitated by mixing freshly prepared solutions of barium hydroxide and sulfurous acid. Sucrose was recrystallized from alcohol.																																												
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<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Sulfur dioxide; SO <sub>2</sub> ; [7446-09-5] 3. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Conrad, F.H.; Beuschlein, W.L. <i>J. Am. Chem. Soc.</i> <u>1934</u> , 56, 2554-62.																					
<b>VARIABLES:</b> One temperature: 298 K Pressure of SO <sub>2</sub>	<b>PREPARED BY:</b> B. Engelen																					
<b>EXPERIMENTAL VALUES:</b> <table border="1" data-bbox="189 499 1136 604"> <thead> <tr> <th>t/°C</th> <th>P<sub>total</sub> mm Hg</th> <th>P<sub>SO<sub>2</sub></sub><sup>a</sup> 10<sup>-3</sup> bar</th> <th colspan="2">g SO<sub>2</sub>/100 g H<sub>2</sub>O</th> <th>BaSO<sub>3</sub><sup>c</sup> g/kg H<sub>2</sub>O</th> <th>m(BaSO<sub>3</sub>)<sup>c</sup> mol kg<sup>-1</sup></th> </tr> <tr> <th></th> <th></th> <th></th> <th>total</th> <th>combined<sup>b</sup></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>25</td> <td>659</td> <td>847</td> <td>7.23</td> <td>0.25</td> <td>8.48</td> <td>0.039</td> </tr> </tbody> </table> <p data-bbox="113 681 838 711">a Corrected for P<sub>H<sub>2</sub>O</sub> and converted to bar by the compiler.</p> <p data-bbox="113 713 605 743">b SO<sub>2</sub> required to form the monosulfite.</p> <p data-bbox="113 745 703 776">c Calculated from combined SO<sub>2</sub> by the compiler.</p>		t/°C	P <sub>total</sub> mm Hg	P <sub>SO<sub>2</sub></sub> <sup>a</sup> 10 <sup>-3</sup> bar	g SO <sub>2</sub> /100 g H <sub>2</sub> O		BaSO <sub>3</sub> <sup>c</sup> g/kg H <sub>2</sub> O	m(BaSO <sub>3</sub> ) <sup>c</sup> mol kg <sup>-1</sup>				total	combined <sup>b</sup>			25	659	847	7.23	0.25	8.48	0.039
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<b>METHOD APPARATUS/PROCEDURE:</b> Equilibrium, which was established after more than 12 hr, was studied in a special flask with connections to a weighing pipette for analysing the saturated solution, and to a mercury monometer to measure the pressure of the gas over the solution. Total, free and combined SO <sub>2</sub> were determined by acidimetric and iodometric titration, respectively (1).	<b>SOURCE AND PURITY OF MATERIALS:</b> Preparation of BaSO <sub>3</sub> was not given. The SO <sub>2</sub> used was SO <sub>3</sub> -free. The amount of inert or non-absorbable gases was about 0.15%.																					
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<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Sodium chloride; NaCl; [7647-14-5] 3. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Cohen, A.; Zangen, M.; Goldschmidt, J.M.E. <i>Rev. Chim. Miner.</i> <u>1981</u> , 18, 142-7.
<b>VARIABLES:</b> One temperature: 298 K One concentration of NaCl: 0.7 mol dm <sup>-3</sup> Time of stirring	<b>PREPARED BY:</b> H.D. Lutz
<b>EXPERIMENTAL VALUES:</b> <p>The solubility of rapidly precipitated BaSO<sub>3</sub> at 25°C decreases from 3.0 x 10<sup>-4</sup> to 2.3 x 10<sup>-4</sup> mol kg<sup>-1</sup> (molality) within 24 hr. The change in the solubility is attributed to phase transition of the obtained barium sulfite.</p>	
<b>AUXILIARY INFORMATION</b>	
<b>METHOD APPARATUS/PROCEDURE:</b> The solubility of BaSO <sub>3</sub> was determined in a stirred solution of aqueous NaCl (concentration 0.7 mol dm <sup>-3</sup> ). Method of analysis not given.	<b>SOURCE AND PURITY OF MATERIALS:</b> Barium sulfite was precipitated by mixing equivalent amounts of aqueous solutions of BaCl <sub>2</sub> and Na <sub>2</sub> SO <sub>3</sub> .  <b>ESTIMATED ERROR:</b>  <b>REFERENCES:</b>

<b>COMPONENTS:</b> 1. Barium sulfite; BaSO <sub>3</sub> ; [7787-39-5] 2. Sodium carbonate; Na <sub>2</sub> CO <sub>3</sub> ; [497-19-8] 3. Sodium sulfite; Na <sub>2</sub> SO <sub>3</sub> ; [7757-83-7] 4. Water; H <sub>2</sub> O; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b>  Mareček, J.; Erdős, E.  <i>Collect. Czech. Chem. Commun.</i> <u>1970</u> , 35, 1017-29.
<b>VARIABLES:</b>  One temperature: 298 K Concentration of Na <sub>2</sub> CO <sub>3</sub> and Na <sub>2</sub> SO <sub>3</sub>	<b>PREPARED BY:</b>  H.D. Lutz
<b>EXPERIMENTAL VALUES:</b> The authors studied the equilibrium of the reaction $\text{BaSO}_3(\text{s}) + \text{CO}_3^{2-} \rightleftharpoons \text{BaCO}_3(\text{s}) + \text{SO}_3^{2-}$ in aqueous solutions of Na <sub>2</sub> CO <sub>3</sub> and Na <sub>2</sub> SO <sub>3</sub> . From the equilibrium constant found at 25°C $K = [\text{SO}_3^{2-}]/[\text{CO}_3^{2-}] = 0.243$ and the activity solubility product of BaCO <sub>3</sub> [513-77-9] reported by Townley <i>et al.</i> (1) and Hogge <i>et al.</i> (2) $K_{\text{SO}}(\text{BaCO}_3) = 2.03 \times 10^{-9} [\text{mol}^2 \text{kg}^{-2}]$ the activity solubility product of barium sulfite at 25°C $K_{\text{SO}}(\text{BaSO}_3) = 4.9 \times 10^{-10} [\text{mol}^2 \text{kg}^{-2}]^{\text{a}}$ was calculated by the authors.  <sup>a</sup> Molality scale.	
<b>AUXILIARY INFORMATION</b>	
<b>METHOD APPARATUS/PROCEDURE:</b> Equilibrium was studied under nitrogen in a special apparatus with connections to a weighing pipette, to analyse the solutions saturated with barium sulfite and barium carbonate. The solutions were made by adding an excess of solid BaSO <sub>3</sub> , BaCO <sub>3</sub> , or mixtures of BaSO <sub>3</sub> and BaCO <sub>3</sub> to solutions containing various amounts of Na <sub>2</sub> SO <sub>3</sub> and Na <sub>2</sub> CO <sub>3</sub> ( $m_{\text{Na}^+} = 0.1$ to $1 \text{ mol kg}^{-1}$ ). Equilibrium was established after 20 hr. Sulfite was determined iodometrically and carbonate acidimetrically after oxidizing the sulfite with H <sub>2</sub> O <sub>2</sub> . Furthermore, the content of sodium was determined gravimetrically as sulfate to check the amount of sulfite oxidized to sulfate in the saturated solution.	<b>SOURCE AND PURITY OF MATERIALS:</b> BaSO <sub>3</sub> was prepared from BaCO <sub>3</sub> and gaseous SO <sub>2</sub> . BaCO <sub>3</sub> was precipitated from saturated Ba(OH) <sub>2</sub> solution with gaseous CO <sub>2</sub> . Sodium carbonate was prepared by thermal decomposition of NaHCO <sub>3</sub> . Water was redistilled, boiled and saturated with N <sub>2</sub> . The other chemicals used were commercial products of p.a. purity.  <b>ESTIMATED ERROR:</b> Temperature: ±0.05 K; K (equilibrium): ±0.7% (estimated by authors).  <b>REFERENCES:</b> 1. Townley, R.W.; Whitney, W.B.; Felsing, W.A. <i>J. Am. Chem. Soc.</i> <u>1937</u> , 59, 631. 2. Hogge, E.; Johnston, H.L. <i>J. Am. Chem. Soc.</i> <u>1939</u> , 61, 2154.