

<b>COMPONENTS:</b> 1. Magnesium sulfite; $\text{MgSO}_3$ ; [7757-88-2] 2. Magnesium sulfate; $\text{MgSO}_4$ ; [7487-88-9] 3. Sulfur dioxide; $\text{SO}_2$ ; [7446-09-5] 4. Water; $\text{H}_2\text{O}$ ; [7732-18-5]				<b>ORIGINAL MEASUREMENTS:</b>  Kuz'minykh, I.N.; Babushkina, M.D.  <i>Zh. Prikl. Khim.</i> <u>1957</u> , <i>30</i> , 466-9; <i>J. Appl. Chem. USSR (Eng. Transl.)</i> <u>1957</u> , <i>30</i> , 495-8.				
<b>VARIABLES:</b> Four temperatures: 283 - 444 K Concentration of $\text{MgSO}_4$ Concentration of $\text{SO}_2$				<b>PREPARED BY:</b>  B. Engelen, H.D. Lutz				
<b>EXPERIMENTAL VALUES:</b> The authors report the $\text{SO}_2$ partial pressure over aqueous solutions saturated with solid magnesium sulfite at various temperatures, various concentrations of sulfurous acid, and small amounts of magnesium sulfate.								
t/°C	$\text{PSO}_2$ mm Hg	$\text{PSO}_2^a$ $10^{-3}$ bar	pH at 20°C	$\text{SO}_2$ (mass %) total free <sup>b</sup>		$\text{MgSO}_4$ mass %	$\text{MgSO}_3^c$ mass % m/mol kg <sup>-1a</sup>	
10	2.05	2.73	3.8	9.62	4.48	1.386	8.37	0.950
	4.95	6.60	3.5	13.04	6.24	0.486	11.08	1.319
	7.61	10.14	3.3	14.94	6.84	0.673	13.2	1.634
	17.51	23.34	3.25	18.35	9.13	0.396	15.0	1.975
	25.53	34.03	3.0	19.89	10.13	1.25	15.9	2.181
	90.0	120.0	-	24.56	12.36	0.168	19.89	2.970
23.3	1.29	1.72	4.1	7.05	2.74	0.099	6.97	0.753
	1.57	2.09	4.1	8.48	3.96	0.709	7.29	0.812
	3.11	4.15	3.88	9.22	4.41	1.014	7.89	0.878
	7.29	9.72	3.5	12.46	5.75	0.598	11.24	1.291
	13.56	18.08	3.45	14.11	6.99	0.653	11.63	1.411
	22.35	29.79	3.26	17.2	7.94	0.445	15.09	1.946
	37.14	49.51	-	19.1	9.34	0.881	15.57	2.138
	38.14	50.84	3.0	19.1	9.3	0.414	15.97	2.133
	47.5	63.32	-	20.2	9.92	1.028	16.75	2.308
	72.18	96.22	2.55	21.86	10.4	0.619	18.53	2.655
	81.16	108.19	2.71	22.66	10.92	0.297	19.18	2.752
	a,b,c See the following page.				(continued on next page)			
AUXILIARY INFORMATION								
<b>METHOD APPARATUS/PROCEDURE:</b> Aqueous solutions of sulfurous acid were kept over magnesium sulfite for several days. Equilibrium pressure of $\text{SO}_2$ was determined dynamically in a special apparatus (1) by passing oxygen-free $\text{N}_2$ gas through the solution-precipitate mixture and analysing the moist inert gas for $\text{SO}_2$ with iodine. Gas volume was measured in an aspirator. Further details are given in ref. (1).				<b>SOURCE AND PURITY OF MATERIALS:</b> Not given.				
				<b>ESTIMATED ERROR:</b> Data given are the results of several experiments which are in satisfactory agreement (given by the authors).				
				<b>REFERENCES:</b> 1. Kuz'minykh, I.N.; Kuznetsova, A.G. <i>Zh. Prikl. Khim.</i> <u>1954</u> , <i>27</i> , 816.				

## COMPONENTS:

1. Magnesium sulfite;  $\text{MgSO}_3$ ; [7757-88-2]
2. Magnesium sulfate;  $\text{MgSO}_4$ ; [7487-88-9]
3. Sulfur dioxide;  $\text{SO}_2$ ; [7446-09-5]
4. Water;  $\text{H}_2\text{O}$ ; [7732-18-5]

## ORIGINAL MEASUREMENTS:

Kuz'minykh, I.N.; Babushkina, M.D.

*Zh. Prikl. Khim.* 1957, *30*, 466-9; *J. Appl. Chem. USSR (Eng. Transl.)* 1957, *30*, 495-8.

## EXPERIMENTAL VALUES (continued):

t/°C	$\text{P}_{\text{SO}_2}$		pH at 20°C	$\text{SO}_2$ (mass %)		$\text{MgSO}_4$ mass %	$\text{MgSO}_3^c$	
	mm Hg	$10^{-3}$ bar		total	free <sup>b</sup>		mass %	m/mol kg <sup>-1a</sup>
48.3	1.33	1.77	4.25	4.36	2.06	1.18	3.75	0.388
	2.88	3.84	4.1	6.37	2.66	0.545	6.06	0.643
	9.5	12.66	3.8	10.2	4.64	0.283	9.10	1.025
	13.2	17.60	3.6	11.78	5.67	0.566	9.99	1.160
	16.36	21.81	3.5	13.04	6.33	0.452	10.95	1.301
	26.07	34.75	-	15.15	7.45	0.188	12.55	1.546
	28.7	38.26	3.3	15.0	7.64	0.282	12.03	1.474
	35.2	46.92	3.1	16.65	8.2	1.51	13.8	1.777
	93.1	124.10	3	19.8	9.7	0.282	16.38	2.226
	70.6	4.12	5.49	4.25	6.37	3.82	0.545	5.76
19.86		26.47	3.85	10.19	4.19	0.357	8.61	0.973
27.4		36.52	3.6	11.77	5.68	0.63	9.95	1.157
42.8		57.05	3.5	13.1	6.38	0.047	10.98	1.298
92		122.6	3.2	16.44	8.06	1.81	13.7	1.763

<sup>a</sup> Calculated by the compilers.

<sup>b</sup> Excess over the amount required to form the monosulfite.

<sup>c</sup> Calculated from total and free  $\text{SO}_2$  by the authors.

<p>COMPONENTS:</p> <ol style="list-style-type: none"> <li>1. Magnesium sulfite; <math>\text{MgSO}_3</math>; [7757-88-2]</li> <li>2. Magnesium sulfate; <math>\text{MgSO}_4</math>; [7487-88-9]</li> <li>3. Magnesium hydrogen sulfite; <math>\text{Mg}(\text{HSO}_3)_2</math>; [13774-25-9]</li> <li>4. Water; <math>\text{H}_2\text{O}</math>; [7732-18-5]</li> </ol>	<p>ORIGINAL MEASUREMENTS:</p> <p>Pinaev, V.A.</p> <p><i>Zh. Prikl. Khim.</i> 1964, 37, 1361-3; <i>J. Appl. Chem. USSR (Eng. Transl.)</i> 1964, 37, 1353-5.</p>
<p>VARIABLES:</p> <p>Three temperatures: 313, 323 and 333 K  Concentration of <math>\text{MgSO}_4</math>  Concentration of <math>\text{Mg}(\text{HSO}_3)_2</math></p>	<p>PREPARED BY:</p> <p>B. Engelen, H.D. Lutz</p>
<p>EXPERIMENTAL VALUES:</p> <p>The author gives solubility diagrams for magnesium sulfite in the systems <math>\text{MgSO}_3</math>-<math>\text{MgSO}_4</math>-<math>\text{H}_2\text{O}</math> (Fig. 1) and <math>\text{MgSO}_3</math>-<math>\text{Mg}(\text{HSO}_3)_2</math>-<math>\text{H}_2\text{O}</math> (Fig. 2) at 40, 50 and 60°C.</p> <div style="display: flex; justify-content: space-around;"> <div> </div> <div> </div> </div> <p style="text-align: center;"> <span style="margin-right: 100px;">Fig. 1</span> <span>Fig. 2</span> </p> <p> <span style="margin-right: 100px;">A: g <math>\text{MgSO}_4</math>/dm<sup>3</sup></span> <span>B: g <math>\text{Mg}(\text{HSO}_3)_2</math>/dm<sup>3</sup></span> <span style="margin-left: 100px;">C: g <math>\text{MgSO}_3</math>/dm<sup>3</sup></span> </p> <p style="text-align: right;">(continued on next page)</p>	
<p>AUXILIARY INFORMATION</p>	
<p>METHOD APPARATUS/PROCEDURE:</p> <p>Saturation method. Equilibrium (constancy of the phase composition) was obtained after several hours.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>Magnesium hydrogen sulfite was prepared from MgO and gaseous <math>\text{SO}_2</math>. <math>\text{MgSO}_4</math>, <math>\text{MgSO}_3 \cdot 6\text{H}_2\text{O}</math> and MgO used were all commercial products.</p>
<p>ESTIMATED ERROR:</p> <p>Solubility: <math>\pm 3\%</math>  Temperature: <math>\pm 0.2</math> K (author)</p>	
<p>REFERENCES:</p>	

COMPONENTS: 1. Magnesium sulfite; $\text{MgSO}_3$ ; [7757-88-2] 2. Magnesium sulfate; $\text{MgSO}_4$ ; [7487-88-9] 3. Magnesium hydrogen sulfite; $\text{Mg}(\text{HSO}_3)_2$ ; [13774-25-9] 4. Water; $\text{H}_2\text{O}$ ; [7732-18-5]	ORIGINAL MEASUREMENTS:  Pinaev, V.A.  <i>Zh. Prikl. Khim.</i> <u>1964</u> , 37, 1361-3; <i>J. Appl. Chem. USSR (Eng. Transl.)</i> <u>1964</u> , 37, 1353-5.
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## EXPERIMENTAL VALUES (continued):

For pure water and several concentration ranges of  $\text{MgSO}_4$  the author also gives numerical data on the solubility of magnesium sulfite (Fig. 1).

$\text{MgSO}_4$ $\text{g dm}^{-3}$	$\text{MgSO}_3$ $\text{g dm}^{-3}$			$\text{MgSO}_3^a$ $\text{mol dm}^{-3} \times 10^3$		
	40°C	50°C	60°C	40°C	50°C	60°C
pure water	10.2-10.9	12.5-13.0	16.0-17.4	97.7-104.4	120-125	153-167
175 - 200	18-20	26-28	34-35	172-192	249-268	326-335
200 - 300	19-20	26-28	34-35	182-192	249-268	326-335
eutonic point	15.0	20.5	24.5	144	196.4	234.7
saturated soln.	10	10	10	96	96	96

The following numerical data were estimated, from the diagram given in Fig. 2, by the compilers.

$t/^\circ\text{C}$	$\text{Mg}(\text{HSO}_3)_2$ $\text{g dm}^{-3}$	$\text{MgSO}_3^b$ $\text{g dm}^{-3}$	$\text{MgSO}_3^c$ $\text{g dm}^{-3}$	$(\text{MgSO}_3)^c$ $\text{mol dm}^{-3} \times 10^3$
40	0	10.8	10.8	103.5
	50	5.5	33.5	320.9
	100	3.8	59.8	572.8
	150	2.7	86.7	830.4
	200	1.7	113.7	1089.0
	250	1.2	141.2	1352.4
50	0	13.0	13.0	124.6
	50	8.6	36.6	350.6
	100	6.6	62.6	599.6
	150	4.7	88.7	849.6
	200	3.8	115.8	1109.2
	250	2.7	142.7	1366.8
60	0	16.4	16.4	157.1
	50	11.6	39.6	379.3
	100	8.3	64.3	615.9
	150	6.8	90.8	869.7
	200	5.5	117.5	1125.5
	250	4.5	144.5	1384.1

<sup>a</sup> Calculated by the compilers.

<sup>b</sup> Determined analytically as the amount of  $\text{SO}_3^{2-}$  present in addition to  $\text{HSO}_3^-$  after establishing equilibrium.

<sup>c</sup> Total amount of dissolved magnesium sulfite ( $\text{MgSO}_3 + \text{Mg}(\text{HSO}_3)_2$ ) as  $\text{MgSO}_3$ , calculated by the compilers.

<b>COMPONENTS:</b> 1. Magnesium sulfite; $\text{MgSO}_3$ ; [7757-88-2] 2. Magnesium hydrogen sulfite; $\text{Mg}(\text{HSO}_3)_2$ ; [13774-25-9] 3. Magnesium sulfate; $\text{MgSO}_4$ ; [7487-88-9] 4. Water; $\text{H}_2\text{O}$ ; [7732-18-5]			<b>ORIGINAL MEASUREMENTS:</b> Semishin, V.I.; Abramov, I.I.; Vorotnitskaya, L.T. <i>Izv. Vyssh. Uchebn. Zaved., Khim. Khim. Technol.</i> 1959, 2, 834-9.		
<b>VARIABLES:</b> Temperature: 308 - 343 K Concentration of $\text{Mg}(\text{HSO}_3)_2$ Amount of $\text{MgSO}_4$ pH: 4 - 9			<b>PREPARED BY:</b> B. Engelen		
<b>EXPERIMENTAL VALUES:</b>					
$t/^\circ\text{C}$	$\text{pH}^a$	$\text{Mg}(\text{HSO}_3)_2^b$ mass %	$\text{MgSO}_3^c$ mass %	$\text{MgSO}_3^d$ mass %	$m(\text{MgSO}_3)^d$ mol $\text{kg}^{-1}$
with 10 mass % $\text{MgSO}_4$					
35	6.20	0.40	0.751	0.97	0.105
	5.36	1.14	0.679	1.32	0.143
	4.75	2.21	0.643	1.88	0.207
	4.40	2.91	0.493	2.12	0.235
	3.82	3.86	0.397	2.56	0.286
40	4.25	4.42	0.578	3.05	0.344
	6.40	0.40	0.867	1.09	0.118
	5.59	1.14	0.837	1.48	0.161
	4.80	2.21	0.901	2.14	0.236
	4.75	2.91	0.716	2.34	0.260
45	4.21	3.86	0.680	2.84	0.318
	4.70	4.42	0.729	3.21	0.363
	6.58	0.40	1.076	1.30	0.141
	5.80	1.14	0.927	1.57	0.171
	4.82	2.21	0.964	2.20	0.243
	4.87	2.91	1.015	2.64	0.294
	4.37	3.86	0.932	3.09	0.348
	4.72	4.42	0.903	3.38	0.382
(continued on next page)					
<b>AUXILIARY INFORMATION</b>					
<b>METHOD APPARATUS/PROCEDURE:</b> Saturation method. Equilibrium was established after 1.5 hr in a thermostatically controlled flask. Amounts of $\text{HSO}_3^-$ and $\text{SO}_3^{2-}$ were determined by a combination of iodometric and acidimetric titration. pH was determined potentiometrically.			<b>SOURCE AND PURITY OF MATERIALS:</b> Magnesium sulfite was prepared by bubbling $\text{SO}_2$ through a suspension of $\text{MgO}$ in water. The precipitated $\text{MgSO}_3 \cdot 6\text{H}_2\text{O}$ was analysed for $\text{Mg}^{2+}$ , $\text{SO}_3^{2-}$ , and $\text{SO}_4^{2-}$ content. $\text{Mg}(\text{HSO}_3)_2$ solutions were obtained and analysed in the same way as above.		
			<b>ESTIMATED ERROR:</b> Deviations in temperature and pH (authors) are $\pm 0.01$ K and $\pm 0.2$ -0.4, respectively.		
			<b>REFERENCES:</b>		

COMPONENTS:		ORIGINAL MEASUREMENTS:			
1. Magnesium sulfite; $MgSO_3$ ; [7757-88-2]		Semishin, V.I.; Abramov, I.I.;			
2. Magnesium hydrogen sulfite; $Mg(HSO_3)_2$ ; [13774-25-9]		Vorotnitskaya, L.T.			
3. Magnesium sulfate; $MgSO_4$ ; [7487-88-9]		<i>Izv. Vyss. Uchebn. Zaved., Khim. Khim. Technol.</i> 1959, 2, 834-9.			
4. Water; $H_2O$ ; [7732-18-5]					
EXPERIMENTAL VALUES (continued):					
$t/^\circ C$	pH <sup>a</sup>	$Mg(HSO_3)_2$ <sup>b</sup> mass %	$MgSO_3$ <sup>c</sup> mass %	$MgSO_3$ <sup>d</sup> mass %	$m(MgSO_3)$ <sup>d</sup> mol $kg^{-1}$
		with 10 mass % $MgSO_4$			
50	7.62	0.40	1.205	1.43	0.155
	5.95	1.14	1.340	1.98	0.217
	4.86	2.21	1.073	2.31	0.255
	5.00	2.91	1.072	2.70	0.301
	4.47	3.86	1.091	3.25	0.366
	4.75	4.42	1.198	3.67	0.417
55	8.00	0.40	1.351	1.57	0.171
	6.03	1.14	1.729	2.37	0.260
	5.20	2.21	1.437	2.67	0.297
	5.12	2.91	1.390	3.02	0.338
	4.62	3.86	1.388	3.55	0.401
	4.87	4.42	1.579	4.05	0.462
60	8.12	0.40	1.520	1.74	0.190
	6.36	1.14	2.050	2.69	0.297
	5.45	2.21	1.787	3.02	0.337
	5.12	2.91	1.596	3.22	0.361
	4.75	3.86	1.725	3.89	0.441
	4.93	4.42	2.014	4.49	0.515
70	8.70	0.40	2.078	2.30	0.252
	6.40	1.14	2.676	3.31	0.368
	5.60	2.21	2.661	3.90	0.439
	5.20	2.91	2.599	4.23	0.479
	4.90	3.86	2.627	4.79	0.549
	4.95	4.42	2.764	5.24	0.606

<sup>a</sup> pH determined at 20 - 25°C.

<sup>b</sup> Concentration of the solution in which solid magnesium sulfite has been dissolved.

<sup>c</sup> Determined analytically as the amount of  $SO_3^{2-}$  present in addition to  $HSO_3^-$  after establishing equilibrium.

<sup>d</sup> Total amount of dissolved magnesium sulfite ( $MgSO_3 + Mg(HSO_3)_2$  as  $MgSO_3$ ), calculated by the compiler.

<p>COMPONENTS:</p> <ol style="list-style-type: none"> <li>1. Magnesium sulfite; <math>\text{MgSO}_3</math>; [7757-88-2]</li> <li>2. Magnesium chloride; <math>\text{MgCl}_2</math>; [7786-30-3]</li> <li>3. Magnesium hydrogen sulfite; <math>\text{Mg}(\text{HSO}_3)_2</math>; [13774-25-9]</li> <li>4. Water; <math>\text{H}_2\text{O}</math>; [7732-18-5]</li> </ol>	<p>ORIGINAL MEASUREMENTS:</p> <p>McIlroy, R.A.  <i>Tappi</i> 1973, 56, 79-82.</p>																				
<p>VARIABLES:</p> <p>One temperature: 344 K  Amount of <math>\text{MgCl}_2</math></p>	<p>PREPARED BY:</p> <p>B. Engelen</p>																				
<p>EXPERIMENTAL VALUES:</p> <p>The author reports the solubility of <math>\text{MgSO}_3 \cdot 3\text{H}_2\text{O}</math> [19086-20-5] in solutions of different <math>\text{MgCl}_2</math> concentrations at 160°F (71.1°C). The pH values of the solutions are also given.</p> <table border="1"> <thead> <tr> <th rowspan="2"><math>\text{MgCl}_2</math> mass %</th> <th rowspan="2">total <math>\text{SO}_2</math> g/100 <math>\text{cm}^3</math></th> <th rowspan="2">free <math>\text{SO}_2^a</math> g/100 <math>\text{cm}^3</math></th> <th rowspan="2">pH</th> <th colspan="2"><math>\text{MgSO}_3^b</math></th> </tr> <tr> <th>mass %</th> <th>m/mol <math>\text{kg}^{-1c}</math></th> </tr> </thead> <tbody> <tr> <td>19.8</td> <td>0.30</td> <td>0.00</td> <td>7.8</td> <td>0.42</td> <td>0.050</td> </tr> <tr> <td>35.7</td> <td>0.32</td> <td>0.02</td> <td>3.4</td> <td>0.34</td> <td>0.050</td> </tr> </tbody> </table> <p><sup>a</sup> Excess over the amount necessary to form the monosulfite.  <sup>b</sup> Calculated from total and free <math>\text{SO}_2</math> content by the author.  <sup>c</sup> Calculated by the compiler.</p>		$\text{MgCl}_2$ mass %	total $\text{SO}_2$ g/100 $\text{cm}^3$	free $\text{SO}_2^a$ g/100 $\text{cm}^3$	pH	$\text{MgSO}_3^b$		mass %	m/mol $\text{kg}^{-1c}$	19.8	0.30	0.00	7.8	0.42	0.050	35.7	0.32	0.02	3.4	0.34	0.050
$\text{MgCl}_2$ mass %	total $\text{SO}_2$ g/100 $\text{cm}^3$					free $\text{SO}_2^a$ g/100 $\text{cm}^3$	pH	$\text{MgSO}_3^b$													
		mass %	m/mol $\text{kg}^{-1c}$																		
19.8	0.30	0.00	7.8	0.42	0.050																
35.7	0.32	0.02	3.4	0.34	0.050																
<p>AUXILIARY INFORMATION</p>																					
<p>METHOD APPARATUS/PROCEDURE:</p> <p>Saturation method. <math>\text{MgO}</math> was added to a solution of <math>\text{MgCl}_2</math> containing <math>\text{Mg}(\text{HSO}_3)_2</math>. The solutions were analysed for total and free <math>\text{SO}_2</math> by a combination of iodometric and acidimetric titration. Chloride was determined by precipitation titration as <math>\text{AgCl}</math> and magnesium complexometrically.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>The <math>\text{MgCl}_2</math>-<math>\text{Mg}(\text{HSO}_3)_2</math> solutions were prepared by either adding <math>\text{MgCl}_2 \cdot 6\text{H}_2\text{O}</math> to a <math>\text{Mg}(\text{HSO}_3)_2</math> solution or adding <math>\text{MgO}</math> to a nearly saturated <math>\text{MgCl}_2</math> solution, and then bubbling <math>\text{SO}_2</math> through the solution.</p> <p>ESTIMATED ERROR:</p> <p>Not given.</p> <p>REFERENCES:</p>																				