

<p>COMPONENTS:</p> <ol style="list-style-type: none"> 1. Iron(II) sulfite; FeSO_3; [51092-74-1] 2. Water; H_2O; [7732-18-5] 	<p>EVALUATOR:</p> <p>H.D. Lutz, Dept. of Chemistry, University of Siegen, FR Germany.</p> <p>February 1983.</p>
<p>CRITICAL EVALUATION:</p> <p>Iron(II) sulfite forms several well established hydrates, three polymorphic forms of $\text{FeSO}_3 \cdot 3\text{H}_2\text{O}$ [21006-12-1] (α (1-3), β (4), and γ (3), $\text{FeSO}_3 \cdot 5/2\text{H}_2\text{O}$ (3,5,6) [13450-81-2], and $\text{FeSO}_3 \cdot 2\text{H}_2\text{O}$ (3) [21006-12-1]. The trihydrates crystallize from aqueous solutions at or below room temperature, $\text{FeSO}_3 \cdot 5/2\text{H}_2\text{O}$ and $\text{FeSO}_3 \cdot 2\text{H}_2\text{O}$ above 330 and 355 K, respectively (3). Iron(III) sulfite or hydrates of it have not been established.</p> <p>Detailed data on the solubility of iron(II) sulfite are not available. In the older literature (7) it is claimed that iron(II) sulfite is nearly insoluble in water, insoluble in alcohol, and readily soluble in excess of sulfurous acid. Numerical data have been reported only by Terres <i>et al.</i> (8) and by Margulis <i>et al.</i> (9). Margulis <i>et al.</i> (9) report on the solubility of a sesquihydrate, $\text{FeSO}_3 \cdot 3/2\text{H}_2\text{O}$ [50820-24-1]. The solubility of the hydrate studied increases from 0.0276 mass % of FeSO_3 (2.03×10^{-3} mol kg^{-1}, molality) at 293 K to 0.0475 mass % (3.50×10^{-3} mol kg^{-1}) at 353 K. However it is not clear whether this hydrate was really $\text{FeSO}_3 \cdot 3/2\text{H}_2\text{O}$, not found elsewhere, or another hydrate of FeSO_3. Terres <i>et al.</i> (8) report the solubility of iron(II) sulfite identified as $\text{FeSO}_3 \cdot 5\text{H}_2\text{O}$? [96247-21-1] increases with increasing SO_2 content from <0.3 mol kg^{-1} (molality) to 2.0 and 1.4 mol kg^{-1} at 288.2 and 298.2 K, respectively.</p> <p>The data given are doubtful.</p> <p>REFERENCES</p> <ol style="list-style-type: none"> 1. Bugli, G.; Pannetier, G. <i>Bull. Soc. Chim. Fr.</i> <u>1968</u>, 2355. 2. Johansson, L.G.; Lindqvist, O. <i>Acta Crystallogr., Sect. B</i> <u>1979</u>, 35, 1017. 3. Lutz, H.D.; Eckers, W.; Engelen, B. <i>Z. Anorg. Allg. Chem.</i> <u>1981</u>, 475, 165. 4. Johansson, L.G.; Ljungstroem, E. <i>Acta Crystallogr., Sect. B</i> <u>1979</u>, 35, 2683. 5. Bugli, G. <i>Bull. Soc. Chim. Fr.</i> <u>1977</u>, 639. 6. Johansson, L.G.; Ljungstroem, E. <i>Acta Crystallogr., Sect. B</i> <u>1980</u>, 36, 1184. 7. Koene <i>Pogg. Ann.</i> <u>1844</u>, 63, 440. 8. Terres, E.; Ruhl, G. <i>Angew. Chem.</i> <u>1934</u>, 47, 332. 9. Margulis, E.V.; Rodin, I.V.; Gubieva, D.N. <i>Zh. Neorg. Khim.</i> <u>1981</u>, 26, 2267; <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1981</u>, 26, 1220. 	

COMPONENTS: 1. Iron(II) sulfite; FeSO_3 ; [51092-74-1] 2. Water; H_2O ; [7732-18-5]	ORIGINAL MEASUREMENTS: Margulis, E.V.; Rodin, I.V.; Gubieva, D.N. <i>Zh. Neorg. Khim.</i> <u>1981</u> , 26, 2267-9; <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1981</u> , 26, 1220-1.															
VARIABLES: Four temperatures: 293 - 353 K	PREPARED BY: H.D. Lutz															
EXPERIMENTAL VALUES: The authors report the solubility of $\text{FeSO}_3 \cdot 3/2\text{H}_2\text{O}$ [50820-24-1] in pure water at 20, 50, 70, and 80°C. <table border="1" data-bbox="397 564 850 745" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">$t/^\circ\text{C}$</th> <th style="text-align: center;">FeSO_3 mass %</th> <th style="text-align: center;">$m(\text{FeSO}_3)^a$ mol kg^{-1}</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">20</td> <td style="text-align: center;">0.0276</td> <td style="text-align: center;">0.002031</td> </tr> <tr> <td style="text-align: center;">50</td> <td style="text-align: center;">0.0355</td> <td style="text-align: center;">0.002613</td> </tr> <tr> <td style="text-align: center;">70</td> <td style="text-align: center;">0.0432</td> <td style="text-align: center;">0.003180</td> </tr> <tr> <td style="text-align: center;">80</td> <td style="text-align: center;">0.0475</td> <td style="text-align: center;">0.003497</td> </tr> </tbody> </table> <p>^a Calculated by the compiler.</p>		$t/^\circ\text{C}$	FeSO_3 mass %	$m(\text{FeSO}_3)^a$ mol kg^{-1}	20	0.0276	0.002031	50	0.0355	0.002613	70	0.0432	0.003180	80	0.0475	0.003497
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METHOD APPARATUS/PROCEDURE: The solubility of iron sulfite was determined from the concentration of Fe^{2+} in a saturated solution. Iron sulfite was dissolved in deoxygenated distilled water (solid/liquid ratio 1:4) in closed flasks placed in a water thermostat, with mechanical stirring. Saturation was assumed when $c_{\text{Fe}^{2+}}$ stopped increasing with time. In all cases, 1 hr was sufficient for equilibrium. Iron sulfite is hydrolysed at 90°C, with the liberation of SO_2 and the formation of a pale-yellow hydroxide sulfite. Iron was determined colorimetrically.	SOURCE AND PURITY OF MATERIALS: Iron sulfite was synthesized by precipitation from a concentrated solution of the sulfite by adding Na_2SO_3 (105% of the stoichiometric quantity) at room temperature with mechanical stirring. The sulfite precipitate was washed with distilled water which had been deoxygenated by boiling, to avoid oxidation of the sulfite. ESTIMATED ERROR: Temperature: ± 0.5 K (authors). REFERENCES.															

<p>COMPONENTS:</p> <ol style="list-style-type: none"> 1. Iron(II) sulfite; FeSO_3; [51092-74-1] 2. Sulfur dioxide; SO_2; [7446-09-5] 3. Water; H_2O; [7732-18-5] 	<p>ORIGINAL MEASUREMENTS:</p> <ol style="list-style-type: none"> 1. Terres, E.; Ruhl, G. <i>Angew. Chem.</i> <u>1934</u>, 47, 332-4. 2. Terres, E.; Ruhl, G. <i>Beitrage zur Chemie der schwefligen Saure, Beiheft zu den Zeitschriften des Vereins deutscher Chemiker No 8</i> <u>1934</u>. 																														
<p>VARIABLES:</p> <p>Two temperatures: 288 and 298 K Concentration of SO_2</p>	<p>PREPARED BY:</p> <p>H.D. Lutz, B. Engelen</p>																														
<p>EXPERIMENTAL VALUES:</p> <p>The authors report the solubility of $\text{FeSO}_3 \cdot 5(?)\text{H}_2\text{O}$ in aqueous sulfurous acid solutions at 15 and 25°C. The first paper reports the experimental data only in a graph. Numerical data are reported in the second paper.</p> <div data-bbox="239 641 1180 1111" style="text-align: center;"> <table border="1" style="margin: 10px auto;"> <caption>Estimated data from the graph</caption> <thead> <tr> <th>SO_2 (mol %)</th> <th>FeO (mol %) at 15°C</th> <th>FeO (mol %) at 25°C</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.5</td><td>0.5</td></tr> <tr><td>1.0</td><td>2.1</td><td>1.8</td></tr> <tr><td>2.0</td><td>2.5</td><td>2.0</td></tr> <tr><td>3.0</td><td>2.3</td><td>1.7</td></tr> <tr><td>4.0</td><td>2.2</td><td>1.2</td></tr> <tr><td>6.0</td><td>2.4</td><td>1.5</td></tr> <tr><td>8.0</td><td>2.8</td><td>2.2</td></tr> <tr><td>95</td><td>0.2</td><td>0.2</td></tr> <tr><td>100</td><td>0.2</td><td>0.2</td></tr> </tbody> </table> </div> <p>Reprinted by permission (continued on next page)</p>		SO_2 (mol %)	FeO (mol %) at 15°C	FeO (mol %) at 25°C	0	0.5	0.5	1.0	2.1	1.8	2.0	2.5	2.0	3.0	2.3	1.7	4.0	2.2	1.2	6.0	2.4	1.5	8.0	2.8	2.2	95	0.2	0.2	100	0.2	0.2
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<p>METHOD APPARATUS/PROCEDURE:</p> <p>SO_2-H_2O mixtures were treated together with solid iron sulfite in closed glass ampoules at the stated temperatures. The solutions obtained were filtered through a fine glass frit and after oxidation of sulfite to sulfate were analysed for sulfate and iron.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>Iron(II) sulfite was precipitated from a solution of iron(II) chloride with sodium sulfite.</p> <hr/> <p>ESTIMATED ERROR:</p> <hr/> <p>REFERENCES:</p>																														

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EXPERIMENTAL VALUES (continued):			
Composition of the saturated solutions ^a			
SO_2 mol %	FeO mol %	$m(\text{FeO})^b$ mol kg ⁻¹	Solid phase
<u>Temperature = 15°C</u>			
0.35	0.65	0.36	$\text{FeSO}_3 \cdot 5(?)\text{H}_2\text{O}$
1.16	2.15	1.23	"
1.75	2.42	1.40	$\text{Fe}(\text{HSO}_3)_2^?$
3.44	2.18	1.28	"
5.92	2.44	1.48	"
7.32	2.63	1.62	"
8.53	3.21	2.02	"
<u>Temperature = 25°C</u>			
0.45	0.32	0.18	$\text{FeSO}_3 \cdot 5(?)\text{H}_2\text{O}$
0.96	0.71	0.40	"
1.78	1.72	0.99	"
2.51	1.65	0.96	$\text{Fe}(\text{HSO}_3)_2(?)$
3.85	1.24	0.73	"
6.20	1.52	0.91	"
8.43	2.26	1.40	"
^a The mixtures separate into two liquid layers at concentrations of SO_2 between 8.6 and 93 mol %. ^b Calculated by the compilers.			