

<p>COMPONENTS:</p> <ol style="list-style-type: none"> 1. Cobalt(II) sulfite; CoSO_3; [32702-66-2] 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>Cobalt sulfite crystallizes from aqueous solutions in the form of several hydrates. The formation of the various hydrates depends on temperature, composition of the solution, especially the amount of sulfurous acid, and preparation technique. Furthermore numerous sulfite complexes of trivalent cobalt are known. The existence of the following cobalt sulfite hydrates has been established: $\text{CoSO}_3 \cdot 6\text{H}_2\text{O}$ (1,2) [60936-55-2], $\text{CoSO}_3 \cdot 3\text{H}_2\text{O}$ (o.-rh.) (1,3,4) [20911-44-8], $\text{CoSO}_3 \cdot 3\text{H}_2\text{O}$ (mon.) (1,3) [20911-44-8], $\text{CoSO}_3 \cdot 5/2\text{H}_2\text{O}$ (1,3,4) [20911-45-9] and $\text{CoSO}_3 \cdot 2\text{H}_2\text{O}$ (1,4) [65410-84-6]. The solubility of these hydrates has not yet been thoroughly investigated. Several authors report that cobalt sulfite is nearly insoluble in water (5,6), insoluble in alcohol (6,7), readily soluble in sulfurous acid (5-7) and in other acids, with decomposition. The solid phases studied in the older literature were $\text{CoSO}_3 \cdot 6\text{H}_2\text{O}$ (5-7) and probably $\text{CoSO}_3 \cdot 3\text{H}_2\text{O}$ (o.-rh.) (6,7). Numerical data on the solubility of cobalt sulfite were given by Margulis et al. (8), who report that the solubility of $\text{CoSO}_3 \cdot 3\text{H}_2\text{O}$ (modification not given, but probably the o.-rh. form) in water increases from 0.209 mass % of CoSO_3 ($m(\text{CoSO}_3) = 0.0151 \text{ mol kg}^{-1}$) at 293 K to 0.316 mass % ($0.0228 \text{ mol kg}^{-1}$) at 363 K. Preliminary studies in our laboratory showed a solubility of about $10^{-3} \text{ mol dm}^{-3}$ at ambient temperature. A tentative value cannot be given.</p> <p>REFERENCES</p> <ol style="list-style-type: none"> 1. Lutz, H.D.; Eckers, W.; Engelen, B. <i>Z. Anorg. Allg. Chem.</i> <u>1981</u>, 475, 165. 2. Klasens, H.A.; Perdok, W.G.; Terpstra, P. <i>Z. Kristallogr.</i> <u>1936</u>, 94, 1. 3. Bugli, G.; Pannetier, G. <i>C.R. Hebd. Seances Acad. Sci., Paris, Ser. C</i> <u>1968</u>, 267, 234. 4. Lutz, H.D.; El-Suradi, S.M.; Engelen, B. <i>Z. Naturforsch., Teil B</i> <u>1977</u>, 32, 1230. 5. Shelton, F.K. <i>U.S. Bur. Mines, Rep. Invest.</i> <u>1946</u>, No. 3836, 14. 6. Rammelsberg, C. <i>Pogg. Ann.</i> <u>1846</u>, 67, 245. 7. Rohrig, A. <i>J. Prakt. Chem.</i> <u>1888</u>, 37, 217. 8. 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. 	

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VARIABLES: Four temperatures: 293 - 353 K	PREPARED BY: H.D. Lutz																									
EXPERIMENTAL VALUES: The authors report the solubility of $\text{CoSO}_3 \cdot 3\text{H}_2\text{O}$ [20911-44-8] in pure water at 20, 50, 70, and 90°C. <table border="1" data-bbox="219 564 1097 766"> <thead> <tr> <th>t/°C</th> <th>CoSO_3^a mass %</th> <th>$m(\text{CoSO}_3)^{a,b}$ mol kg⁻¹</th> <th>CoSO_3^c mass %</th> <th>$m(\text{CoSO}_3)^{b,c}$ mol kg⁻¹</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>0.217</td> <td>0.01565</td> <td>0.209</td> <td>0.01507</td> </tr> <tr> <td>50</td> <td>0.248</td> <td>0.01789</td> <td>-</td> <td>-</td> </tr> <tr> <td>70</td> <td>0.297</td> <td>0.02143</td> <td>-</td> <td>-</td> </tr> <tr> <td>90</td> <td>0.326</td> <td>0.02353</td> <td>0.316</td> <td>0.02281</td> </tr> </tbody> </table> <p> ^a From concentration of Co^{2+}. ^b Calculated by the compiler. ^c From the SO_3^{2-} concentration. </p>		t/°C	CoSO_3^a mass %	$m(\text{CoSO}_3)^{a,b}$ mol kg ⁻¹	CoSO_3^c mass %	$m(\text{CoSO}_3)^{b,c}$ mol kg ⁻¹	20	0.217	0.01565	0.209	0.01507	50	0.248	0.01789	-	-	70	0.297	0.02143	-	-	90	0.326	0.02353	0.316	0.02281
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AUXILIARY INFORMATION																										
METHOD APPARATUS/PROCEDURE: The solubility of cobalt sulfite was determined from the concentration of Co^{2+} in the saturated solution, and in some experiments also from the SO_3^{2-} concentration. Cobalt 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 $c_{\text{Co}^{2+}}$ stopped increasing with time. In all cases, 3 hr was sufficient for equilibrium. Cobalt was determined colorimetrically, sulfite iodometrically.	SOURCE AND PURITY OF MATERIALS: Cobalt 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. <table border="1" data-bbox="664 1572 1227 1713"> <tbody> <tr> <td> ESTIMATED ERROR: Temperature: ± 0.5 K (authors). </td> </tr> <tr> <td> REFERENCES: </td> </tr> </tbody> </table>	ESTIMATED ERROR: Temperature: ± 0.5 K (authors).	REFERENCES:																							
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