

<b>COMPONENTS:</b>  1. Cadmium sulfite; $\text{CdSO}_3$ ; [13477-23-1]  2. Water; $\text{H}_2\text{O}$ ; [7732-18-5]	<b>EVALUATOR:</b>  H.D. Lutz, Dept. of Chemistry, University of Siegen, FR Germany.  October 1983
<b>CRITICAL EVALUATION:</b>  Cadmium sulfite crystallizes from aqueous solutions as hydrates and the anhydrous salt. Some are well established, such as $\text{CdSO}_3 \cdot 3/2\text{H}_2\text{O}$ (1,2) [60943-67-1] and several polymorphic forms of the anhydrous salt $\text{CdSO}_3$ , I( $\alpha$ ) (1), II, and III (3). Numerical data on the solubility of cadmium sulfite in water and in the presence of $\text{CdSO}_4$ , $\text{Na}_2\text{SO}_3$ , and $\text{Na}_2\text{SO}_4$ , respectively, have been given by Margulis and Rodin (4), but from the data it is not clear what kind of solid phase was present in the solutions studied.  <b>REFERENCES</b>  1. Lutz, H.D.; El-Suradi, S. <i>Z. Anorg. Allg. Chem.</i> <u>1976</u> , 425, 134. 2. Kiers, C.T.; Vos, A. <i>Cryst. Struct. Commun.</i> <u>1978</u> , 7, 399. 3. Lutz, H.D.; Buchmeier, W.; Eckers, W.; Engelen, B. <i>Z. Anorg. Allg. Chem.</i> <u>1983</u> , 496, 21. 4. Margulis, E.V.; Rodin, I.V. <i>Zh. Neorg. Khim.</i> <u>1981</u> , 26, 1428; * <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1981</u> , 26, 767.	

<p>COMPONENTS:</p> <p>1. Cadmium sulfite; <math>\text{CdSO}_3</math>; [13477-23-1]</p> <p>2. Water; <math>\text{H}_2\text{O}</math>; [7732-18-5]</p>	<p>ORIGINAL MEASUREMENTS:</p> <p>Margulis, E.V.; Rodin, I.V.</p> <p><i>Zh. Neorg. Khim.</i> <u>1981</u>, 26, 1428-30;  <i>*Russ. J. Inorg. Chem. (Eng. Transl.)</i>  <u>1981</u>, 26, 767-8.</p>															
<p>VARIABLES:</p> <p>Two temperatures: 293 and 363 K</p>	<p>PREPARED BY:</p> <p>B. Engelen</p>															
<p>EXPERIMENTAL VALUES:</p> <table border="1"> <thead> <tr> <th><math>t/^\circ\text{C}</math></th> <th><math>\text{Cd}^{2+}</math> g/dm<sup>3</sup></th> <th><math>\text{CdSO}_3</math> mass %</th> <th><math>c(\text{CdSO}_3)^a</math> <math>10^{-3}</math> mol dm<sup>-3</sup></th> <th><math>m(\text{CdSO}_3)^a</math> <math>10^{-3}</math> mol kg<sup>-1</sup></th> </tr> </thead> <tbody> <tr> <td>20</td> <td>0.248</td> <td>0.0426</td> <td>2.21</td> <td>2.21</td> </tr> <tr> <td>90</td> <td>0.232</td> <td>0.0398</td> <td>2.06</td> <td>2.07</td> </tr> </tbody> </table> <p><sup>a</sup> Calculated by the compiler.</p>		$t/^\circ\text{C}$	$\text{Cd}^{2+}$ g/dm <sup>3</sup>	$\text{CdSO}_3$ mass %	$c(\text{CdSO}_3)^a$ $10^{-3}$ mol dm <sup>-3</sup>	$m(\text{CdSO}_3)^a$ $10^{-3}$ mol kg <sup>-1</sup>	20	0.248	0.0426	2.21	2.21	90	0.232	0.0398	2.06	2.07
$t/^\circ\text{C}$	$\text{Cd}^{2+}$ g/dm <sup>3</sup>	$\text{CdSO}_3$ mass %	$c(\text{CdSO}_3)^a$ $10^{-3}$ mol dm <sup>-3</sup>	$m(\text{CdSO}_3)^a$ $10^{-3}$ mol kg <sup>-1</sup>												
20	0.248	0.0426	2.21	2.21												
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<p>AUXILIARY INFORMATION</p>																
<p>METHOD APPARATUS/PROCEDURE:</p> <p>Saturation method. Equilibrium was established by stirring the saturated solutions in closed thermostatically controlled glass tubes. Equilibrium was tested for analytically - 1 hr was reported to be sufficient. Cadmium was determined polarographically, sulfite iodometrically. For conversion into molality units, the density of the solutions was measured pycnometrically at room temperature.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>Cadmium sulfite, claimed to be <math>\text{CdSO}_3 \cdot 2\text{H}_2\text{O}</math>, was obtained by precipitation from <math>\text{CdSO}_4</math> solutions with <math>\text{Na}_2\text{SO}_3</math>. The precipitate was washed with water and dry acetone. <math>\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}</math> and <math>\text{Na}_2\text{SO}_3</math> of p.a. quality were used.</p> <p>ESTIMATED ERROR:</p> <p>Temperature: <math>\pm 0.5</math> K  Solubility: <math>2.7 \times 10^{-5}</math> and <math>3.1 \times 10^{-5}</math> for molarity and molality units, respectively.</p> <p>REFERENCES.</p>															

COMPONENTS:		ORIGINAL MEASUREMENTS:		
1. Cadmium sulfite; $\text{CdSO}_3$ ; [13477-23-1] 2. Cadmium sulfate; $\text{CdSO}_4$ ; [10124-36-4] 3. Water; $\text{H}_2\text{O}$ ; [7732-18-5]		Margulis, E.V.; Rodin, I.V. <i>Zh. Neorg. Khim.</i> <u>1981</u> , 26, 1428-30; * <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> <u>1981</u> , 26, 767-8.		
VARIABLES:		PREPARED BY:		
Two temperatures: 293 and 363 K Concentration of cadmium sulfate		B. Engelen		
EXPERIMENTAL VALUES:				
$t/^\circ\text{C}$	$\text{CdSO}_4$ mass %	$\text{CdSO}_3$ mass %	$m(\text{CdSO}_4)^a$ $\text{mol kg}^{-1}$	$m(\text{CdSO}_3)^a$ $10^{-3} \text{ mol kg}^{-1}$
20	1.415	0.052	0.6889	2.742
20	5.31	0.056	0.2692	3.075
20	14.89	0.065	0.8399	3.971
20	31.61	0.087	2.220	6.618
20	43.51	0.106	3.702	9.768
90	36.83	0.083	2.801	6.836
<sup>a</sup> Calculated by the compiler.				
AUXILIARY INFORMATION				
METHOD APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
<p><math>\text{CdSO}_4</math> solutions were saturated with solid cadmium sulfite and stirred in a thermostatically controlled closed glass tube. Equilibrium was tested for analytically - 1 hr was reported to be sufficient. Cadmium was determined polarographically, sulfite iodometrically. Sulfate determination method is not given. For conversion from <math>\text{g/dm}^3</math> into mass % the density of the solutions was measured at room temperature.</p>		<p>Cadmium sulfite, claimed to be <math>\text{CdSO}_3 \cdot 2\text{H}_2\text{O}</math>, was obtained by precipitation from <math>\text{CdSO}_4</math> solutions with <math>\text{Na}_2\text{SO}_3</math>. The precipitate was washed with water and dry acetone. <math>\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}</math> and <math>\text{Na}_2\text{SO}_3</math> of p.a. quality were used.</p>		
		ESTIMATED ERROR:		
		Temperature: 0.5 K		
		REFERENCES:		

COMPONENTS:			ORIGINAL MEASUREMENTS:		
1. Cadmium sulfite; $\text{CdSO}_3$ ; [13477-23-1]			Margulis, E.V.; Rodin, I.V.  <i>Zh. Neorg. Khim.</i> 1981, 26, 1428-30; * <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> 1981, 26, 767-8.		
2. Sodium sulfite; $\text{Na}_2\text{SO}_3$ ; [7757-83-7]					
3. Sodium sulfate; $\text{Na}_2\text{SO}_4$ ; [7757-82-6]					
4. Water; $\text{H}_2\text{O}$ ; [7732-18-5]					
VARIABLES:			PREPARED BY:		
Temperature: 293 K (363 K) Concentration of $\text{Na}_2\text{SO}_3$ and $\text{Na}_2\text{SO}_4$			B. Engelen		
EXPERIMENTAL VALUES:					
Composition of the solutions (mass %)			$m(\text{Na}_2\text{SO}_3)^a$	$m(\text{Na}_2\text{SO}_4)^a$	$m(\text{CdSO}_3)^a$
$\text{Na}_2\text{SO}_3$	$\text{Na}_2\text{SO}_4$	$\text{CdSO}_3$	$\text{mol kg}^{-1}$	$\text{mol kg}^{-1}$	$10^{-3} \text{ mol kg}^{-1}$
0.005	-	0.043	0.0003	-	2.236
0.300	-	0.040	0.0239	-	2.085
0.440	-	0.030	0.0351	-	1.566
0.700	-	0.029	0.0559	-	1.518
0.800	-	0.028	0.0640	-	1.467
1.643	-	0.036	0.1326	-	1.902
5.54	-	0.078	0.466	-	4.294
7.99	-	0.106	0.690	-	5.993
12.60	-	0.181	1.146	-	10.78
21.89	-	0.220	2.230	-	14.68
21.89 <sup>b</sup>	-	0.217 <sup>b</sup>	2.230 <sup>b</sup>	-	14.47
<p><sup>a</sup> Calculated by the compiler.</p> <p><sup>b</sup> Experiment done at 90°C.</p> <p style="text-align: right;">(continued on next page)</p>					
AUXILIARY INFORMATION					
METHOD APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS.		
<p><math>\text{CdSO}_4</math> solutions were saturated with solid cadmium sulfite and stirred in a thermostatically controlled closed glass tube. Equilibrium was tested for analytically - 1 hr was reported to be sufficient. Cadmium was determined polarographically, sulfite iodometrically, and sodium photometrically. Sulfate determination method not given. For conversion from <math>\text{g} \times \text{dm}^{-3}</math> into mass %, the density of the solutions was measured at room temperature.</p>			<p>Cadmium sulfite, claimed to be <math>\text{CdSO}_3 \cdot 2\text{H}_2\text{O}</math>, was obtained by precipitation from <math>\text{CdSO}_4</math> solutions with <math>\text{Na}_2\text{SO}_3</math>. The precipitate was washed with water and dry acetone. <math>\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}</math>, <math>\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}</math>, and <math>\text{Na}_2\text{SO}_3</math> of p.a. quality were used.</p>		
			ESTIMATED ERROR:		
			Temperature: 0.5 K		
REFERENCES:					

COMPONENTS			ORIGINAL MEASUREMENTS:		
1. Cadmium sulfite; $\text{CdSO}_3$ ; [13477-23-1]			Margulis, E.V.; Rodin, I.V. <i>Zh. Neorg. Khim.</i> 1981, 26, 1428-30; * <i>Russ. J. Inorg. Chem. (Eng. Transl.)</i> 1981, 26, 767-8.		
2. Sodium sulfite; $\text{Na}_2\text{SO}_3$ ; [7757-83-7]					
3. Sodium sulfate; $\text{Na}_2\text{SO}_4$ ; [7757-82-6]					
4. Water; $\text{H}_2\text{O}$ ; [7732-18-5]					
EXPERIMENTAL VALUES (continued):					
Composition of the solutions (mass %)			$m(\text{Na}_2\text{SO}_3)^a$	$m(\text{Na}_2\text{SO}_4)^a$	$m(\text{CdSO}_3)^a$
$\text{Na}_2\text{SO}_3$	$\text{Na}_2\text{SO}_4$	$\text{CdSO}_3$	mol $\text{kg}^{-1}$	mol $\text{kg}^{-1}$	$10^{-3}$ mol $\text{kg}^{-1}$
-	1.011	0.045	-	0.0719	2.363
-	4.11	0.048	-	0.302	2.602
-	7.30	0.055	-	0.555	3.085
-	10.21	0.062	-	0.8011	3.590
-	15.35	0.078	-	1.278	4.792
-	28.62 <sup>b</sup>	0.098 <sup>b</sup>	-	2.827 <sup>b</sup>	7.143
0.005	1.5	0.048	0.0403	0.107	2.533
0.005	4.5	0.050	0.0416	0.332	2.722
0.005	5.8	0.051	0.0421	0.434	2.815
0.005	7.2	0.057	0.0428	0.547	3.194
0.300	1.5	0.042	2.425	0.108	2.223
0.300	4.5	0.044	2.501	0.333	2.403
0.300	5.8	0.047	2.536	0.435	2.602
0.300	7.2	0.049	2.575	0.548	2.754
0.440	1.5	0.033	3.561	0.108	1.749
0.440	4.5	0.038	3.674	0.333	2.078
0.440	5.8	0.042	3.725	0.436	2.329
0.440	7.2	0.045	3.782	0.549	2.533
0.700	1.5	0.031	5.680	0.108	1.647
0.700	4.5	0.035	5.861	0.334	1.919
0.700	5.8	0.037	5.942	0.437	2.060
0.700	7.2	0.041	6.033	0.551	2.314
0.800	1.5	0.030	6.499	0.108	1.596
0.800	4.5	0.034	6.705	0.335	1.866
0.800	5.8	0.037	6.798	0.437	2.059
0.800	7.2	0.040	6.902	0.551	2.260

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

<sup>b</sup> Experiment done at 90°C.