

<b>COMPONENTS:</b> 1. Iron(III) selenite; $\text{Fe}_2(\text{SeO}_3)_3$ ; [15857-44-0] 2a. Nitric acid; $\text{HNO}_3$ ; [7697-37-2] 2b. Sulfuric acid; $\text{H}_2\text{SO}_4$ ; [7664-93-9] 3. Water; $\text{H}_2\text{O}$ ; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b>  Chukhlantsev, V.G.; Tomashevsky, G.P.  <i>Zh. Anal. Khim.</i> 1957, 12, 296-301; * <i>J. Anal. Chem. USSR</i> 1957, 12, 303-9.																																													
<b>VARIABLES:</b>  Nitric and sulfuric acid concentrations One temperature: 293 K	<b>PREPARED BY:</b>  Mary R. Masson																																													
<b>EXPERIMENTAL VALUES:</b> All concentrations are expressed in units of $\text{mol dm}^{-3}$ . <table border="1" data-bbox="233 527 1193 758"> <thead> <tr> <th>Soln.</th> <th>Initial pH</th> <th>Final pH</th> <th><math>[\text{Fe}^{3+}]</math></th> <th>pFe</th> <th><math>\log \alpha_{\text{L(H)}}</math></th> <th><math>\text{p}[\text{SeO}_3^{2-}]</math></th> <th><math>\text{p}K_{\text{SO}}</math></th> </tr> </thead> <tbody> <tr> <td rowspan="2"><math>\text{HNO}_3</math></td> <td>2.41</td> <td>2.68</td> <td><math>1.1 \times 10^{-3}</math></td> <td>2.96</td> <td>5.50</td> <td>8.28</td> <td>30.76</td> </tr> <tr> <td>2.05</td> <td>2.12</td> <td><math>3.4 \times 10^{-3}</math></td> <td>2.47</td> <td>6.33</td> <td>8.61</td> <td>30.77</td> </tr> <tr> <td rowspan="3"><math>\text{H}_2\text{SO}_4</math></td> <td>2.74</td> <td>2.97</td> <td><math>8.2 \times 10^{-4}</math></td> <td>3.09</td> <td>5.13</td> <td>8.04</td> <td>30.30</td> </tr> <tr> <td>2.13</td> <td>2.22</td> <td><math>2.6 \times 10^{-3}</math></td> <td>2.58</td> <td>6.20</td> <td>8.61</td> <td>30.99</td> </tr> <tr> <td>2.08</td> <td>2.17</td> <td><math>2.9 \times 10^{-3}</math></td> <td>2.54</td> <td>6.27</td> <td>8.63</td> <td>30.97</td> </tr> </tbody> </table> <p>The average value is <math>K_{\text{SO}} = 2.0 \times 10^{-31} \text{ mol}^5 \text{ dm}^{15}</math>.            (<math>\text{p}K_{\text{SO}} = 30.7</math>)</p> <p><u>Notes.</u>  <math>[\text{Se}_{\text{tot}}] = 1.5 \times [\text{Fe}^{3+}]</math> and <math>[\text{SeO}_3^{2-}] = [\text{Se}_{\text{tot}}] / \alpha_{\text{L(H)}}</math>            where <math>\alpha_{\text{L(H)}} = (1 + [\text{H}^+] / K_2 + [\text{H}^+]^2 / K_1 K_2)</math>            and the acid dissociation constants have the values <math>K_1 = 4 \times 10^{-3}</math> and  <math>K_2 = 1.0 \times 10^{-8}</math> (ref. 1).</p>		Soln.	Initial pH	Final pH	$[\text{Fe}^{3+}]$	pFe	$\log \alpha_{\text{L(H)}}$	$\text{p}[\text{SeO}_3^{2-}]$	$\text{p}K_{\text{SO}}$	$\text{HNO}_3$	2.41	2.68	$1.1 \times 10^{-3}$	2.96	5.50	8.28	30.76	2.05	2.12	$3.4 \times 10^{-3}$	2.47	6.33	8.61	30.77	$\text{H}_2\text{SO}_4$	2.74	2.97	$8.2 \times 10^{-4}$	3.09	5.13	8.04	30.30	2.13	2.22	$2.6 \times 10^{-3}$	2.58	6.20	8.61	30.99	2.08	2.17	$2.9 \times 10^{-3}$	2.54	6.27	8.63	30.97
Soln.	Initial pH	Final pH	$[\text{Fe}^{3+}]$	pFe	$\log \alpha_{\text{L(H)}}$	$\text{p}[\text{SeO}_3^{2-}]$	$\text{p}K_{\text{SO}}$																																							
$\text{HNO}_3$	2.41	2.68	$1.1 \times 10^{-3}$	2.96	5.50	8.28	30.76																																							
	2.05	2.12	$3.4 \times 10^{-3}$	2.47	6.33	8.61	30.77																																							
$\text{H}_2\text{SO}_4$	2.74	2.97	$8.2 \times 10^{-4}$	3.09	5.13	8.04	30.30																																							
	2.13	2.22	$2.6 \times 10^{-3}$	2.58	6.20	8.61	30.99																																							
	2.08	2.17	$2.9 \times 10^{-3}$	2.54	6.27	8.63	30.97																																							
<b>AUXILIARY INFORMATION</b>																																														
<b>METHOD APPARATUS/PROCEDURE:</b> Solutions of nitric and sulfuric acid were saturated with iron(III) selenite by shaking in a thermostat at $20 \pm 0.05^\circ\text{C}$ for 8 hr. The remaining solid phase was removed by centrifugation, then the pH was measured ("Moskip" pH meter, to 0.01 pH unit) and the iron(III) concentration was determined spectrophotometrically.	<b>SOURCE AND PURITY OF MATERIALS:</b> C.P.-grade reagents were used. Stoichiometric amounts of 0.2N iron(III) sulfate and 0.1N sodium selenite were mixed: the pH of the solution was 5 - 6. After 24 hr, the precipitate was separated by centrifugation and decanting, and dried at $40^\circ\text{C}$ . Iron was determined titrimetrically after reduction with zinc amalgam, and selenium gravimetrically as the element.																																													
	<b>ESTIMATED ERROR:</b> $\pm 1.7 \times 10^{-31}$ . (The spread in the results is 0.69 of a log unit.) Temperature: $\pm 0.05 \text{ K}$																																													
	<b>REFERENCES:</b>  1. Rumpf, P. <i>Compt. Rendu</i> 1933, 197, 686.																																													

COMPONENTS:		ORIGINAL MEASUREMENTS:					
1. Iron(III) selenite; $\text{Fe}_2(\text{SeO}_3)_3$ ; [15857-44-0]		Pinaev, G.F.; Volkova, V.P.					
2. Water; $\text{H}_2\text{O}$ ; [7732-18-5]		<i>Obshch. Prikl. Khim.</i> 1970, 33-9.					
VARIABLES:		PREPARED BY:					
One temperature (room) Concentrations of the components		Mary R. Masson					
EXPERIMENTAL VALUES:							
Concs. in mother liq., g/l.		$[\text{Fe}^{3+}]$ $\times 10^4$	$[\text{Se}_{\text{tot}}]$ $\times 10^3$	Final pH	$\alpha_{\text{L(H)}} \times 10^{-7}$	$[\text{SeO}_3^{2-}]$ $\times 10^{11}$	$K_{\text{SO}} \times 10^{36}$ $\text{mol}^5 \text{dm}^{-15}$
Fe	Se	$\text{mol dm}^{-3}$	$\text{mol dm}^{-3}$			$\text{mol dm}^{-3}$	
0.011	0.3	1.97	3.80	1.31	5.10	7.44	0.016
0.047	0.527	8.42	6.67	1.36	4.10	16.3	3.06
0.025	0.807	4.48	10.2	1.37	3.92	26.0	3.54
0.004	1.412	0.716	9.07	1.42	3.15	28.8	0.122
0.211	0.205	37.8	2.60	1.34	4.47	5.81	2.80
0.337	0.139	60.4	1.76	1.37	3.92	4.49	3.30
0.432	0.104	77.4	1.32	1.44	2.89	4.57	5.73
Mean $K_{\text{SO}} = 3.7 \times 10^{-36} \text{ mol}^5 \text{dm}^{-15}$ (omitting first and fourth results) ( $\text{p}K_{\text{SO}} = 35.43$ )							
The concentrations in g/l. and the final pH values were given in the original paper. The other columns of data were calculated by the compiler.							
Note: $[\text{SeO}_3^{2-}] = [\text{Se}_{\text{tot}}]/\alpha_{\text{L(H)}}$ where $\alpha_{\text{L(H)}} = (1 + [\text{H}^+]/K_2 + [\text{H}^+]^2/K_1K_2)$ , with $K_1 = 10^{-2.35}$ and $K_2 = 10^{-7.94}$							
AUXILIARY INFORMATION							
METHOD APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
This paper describes preparative work on iron(III) selenite, but some analytical data on the mother liquor in one experiment allowed solubility information to be extracted. Various volumes of ferric chloride (at pH 2.1) and selenious acid (pH 2.0) were mixed, and the pH was measured after the precipitate had formed. Both solutions had a constant ionic strength of $3.0 \text{ mol dm}^{-3}$ . This was done at room temperature.							
				ESTIMATED ERROR:			
				Error in $K_{\text{SO}}$ (2s) = $2.5 \times 10^{-36}$ (0.4 log unit)			
				REFERENCES:			