

| COMPONENTS: (1) Lithium phosphate; Li_3PO_4 ; [10377-52-3] (2) Water; H_2O ; [7732-18-5] | ORIGINAL MEASUREMENTS: Rosenheim, A.; Reglin, W. Z. Anorg. Chem. 1921, 120, 103-19. | | | | | | | | | | | | | | | | | | | | |
|---|--|----------------|---|----------------|---|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|
| VARIABLES: One temperature: 25°C | PREPARED BY: J. Eysseľtová and M. Salomon | | | | | | | | | | | | | | | | | | | | |
| EXPERIMENTAL VALUES: The electrolytic conductances of satd Li_3PO_4 slns at 25°C were reported <table border="1" data-bbox="182 547 1136 752"> <thead> <tr> <th>experiment No.</th> <th>$10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$</th> <th>experiment No.</th> <th>$10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20.1</td> <td>5</td> <td>9.43</td> </tr> <tr> <td>2</td> <td>11.5</td> <td>6</td> <td>9.24</td> </tr> <tr> <td>3</td> <td>10.8</td> <td>7</td> <td>9.24</td> </tr> <tr> <td>4</td> <td>9.51</td> <td>8</td> <td>9.25</td> </tr> </tbody> </table> <p>The high κ_{sln} values for expts 1-3 were attributed to impurities and neglected. Based on the data from expts 4-8, the authors reported an ave $\kappa_{\text{sln}} = 9.40 \times 10^{-4} \text{S cm}^{-1}$ and $\kappa_{\text{salt}} = \kappa_{\text{sln}} - \kappa_{\text{H}_2\text{O}} = 9.37 \times 10^{-4} \text{S cm}^{-1}$. The soly of Li_3PO_4 was calcd from</p> $\text{soly} = \frac{1000 \kappa_{\text{salt}}}{3(\lambda_{\text{Li}}^{\infty} + \lambda_{\text{PO}_4}^{\infty})} = (7.688/3) \times 10^{-3} \text{mol dm}^{-3} = 2.563 \times 10^{-3} \text{mol dm}^{-3}$ <p>$\lambda_{\text{Li}^+}^{\infty} = 39.7 \text{S cm}^2 \text{mol}^{-1}$ and was taken from Kohlrausch and Holborn (1). $\lambda_{\text{PO}_4^{3-}}^{\infty} = 82.3 \text{S cm}^2 \text{mol}^{-1}$ was estimated by Böttger (2): both values correspond to 25 C. In the original calculation, the authors neglected to multiply κ_{salt} by 1000, and hence report a solubility too low by this factor. The author's calcs are also subject to rounding off errors amounting to an error of around +1% in the final value for the soly. Additional errors involve the uncertainties in the λ^{∞} values. Although these errors are significant, they are relatively minor to the error involved in neglecting the hydrolysis of the PO_4^{3-} ion. The effect of hydrolysis on the calcn of the soly from conductivity data is discussed in detail in the critical evaluation.</p> | | experiment No. | $10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$ | experiment No. | $10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$ | 1 | 20.1 | 5 | 9.43 | 2 | 11.5 | 6 | 9.24 | 3 | 10.8 | 7 | 9.24 | 4 | 9.51 | 8 | 9.25 |
| experiment No. | $10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$ | experiment No. | $10^4 \kappa_{\text{sln}} / \text{S cm}^{-1}$ | | | | | | | | | | | | | | | | | | |
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| 4 | 9.51 | 8 | 9.25 | | | | | | | | | | | | | | | | | | |
| AUXILIARY INFORMATION | | | | | | | | | | | | | | | | | | | | | |
| METHOD/APPARATUS/PROCEDURE: The soly could not be detd by "standard" methods due to the formation of a fine colloid which could not be removed by filtration. The soly was therefore detd by the conductivity method. Equilibration was attained by shaking at 25°C for 14-21 d. Eight slns were prepared using the same solid phase, but with successive renewal of the water. Initial impurities, as implied by the high κ values of slns 1-3, were assumed to have been completely removed by this washing by the fourth experiment. The electrolytic conductivity of the water was reported to be $\kappa_{\text{H}_2\text{O}} = 3 \times 10^{-6} \text{S cm}^{-1}$. Based on the results $\kappa_{\text{H}_2\text{O}}$ for experiments 4-8, the authors reported an average electrolytic conductivity of $\kappa_{\text{sln}} = 9.40 \times 10^{-4} \text{S cm}^{-1}$. However the compilers compute an average value of $\kappa_{\text{sln}} = 9.33 \times 10^{-4} \text{S cm}^{-1}$, and the electrolytic conductivity of the salt is then $\kappa_{\text{salt}} = \kappa_{\text{sln}} - \kappa_{\text{H}_2\text{O}} = 9.30 \times 10^{-4} \text{S cm}^{-1}$ | SOURCE AND PURITY OF MATERIALS: $\text{Li}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$ was pptd from aq H_3PO_4 with excess LiOH . The dihydrate was washed, air dried at about 16°C and analysed with the following results: Li 13.50, 13.66 mass% found (16.67% calcd); PO_4 62.53, 62.46 mass% found (62.58% calcd); H_2O 23.90, 23.78% found (23.72% calcd). Drying at 60°C for several days gave the hemihydrate which analysed as $\text{Li}_3\text{PO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. Presumably conductivity water was used for prep of slns and washing of ppts. The compilers assume that $\text{Li}_3\text{PO}_4 \cdot 2\text{H}_2\text{O}$ was used as the starting material for all experiments. ESTIMATED ERROR: Nothing specified. The compilers assume the experimental precision to be around $\pm 1 \times 10^{-6} \text{S cm}^{-1}$. The std dev in κ_{salt} is $4.2 \times 10^{-6} \text{S cm}^{-1}$. REFERENCES: <ol style="list-style-type: none"> Kohlrausch, F.; Holborn, O. <i>Das Leitvermögen der Elektrolyte</i>. II Auflage, 1916, Tab. 8a. Böttger, W. Z. Phys. Chem. 1903, 46, 596. | | | | | | | | | | | | | | | | | | | | |