XII.—*Note on the Heats of Dissolution of the Sulphates of Potassium and Lithium.*

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THE existence of anhydrous sodium sulphate in two modifications, as shown in a previous communication (this Journal, Trans., 1884, p. 686), rendered it advisable to investigate the sulphates of other alkali metals in a manner similar to that in which the sodium salt had been examined.

Potassium Sulphate.

The following results were obtained with various specimens of this salt, the initial temperature of the calorimetric water being $22.793^{\circ}\text{C.} \pm 0.05^{\circ}$. All the specimens were powdered and sifted through silk. Proportion of water used, $420\text{ H}_2\text{O}$.

Specimen.	Molecular heat of dissolution.
1. Dried over hydrogen sulphate at about 20°	— 6139 cal.
2. Ditto for seven days	— 6174 „
3. Heated at 100° for 19 hours	— 6044 „
4. Heated at 200° for $2\frac{1}{2}$ hours { — 6237 } — 6239 „	{ — 6241 }
5. Ditto ditto	— 6290 „
6. Heated at a bright red heat for 20 minutes....	— 6168 „
7. Ditto ditto ditto	— 6112 „
Mean.....	— 6167 „

As will be seen, the samples dried at 200° give somewhat higher numbers, — 6256, namely, as a mean, than the others, and it seems preferable to take this number as representing the true heat of dissolution, instead of taking a general mean of all the results, since it was found

that, in spite of the fine state of division to which the salt was reduced, and the long time employed for its desiccation, portions of Nos. 2 and 3, on being heated to redness, decrepitated very slightly, rendering the presence of a small amount of water probable; it is true that the samples which had been heated to redness yielded numbers identical with Nos. 1, 2, and 3, and the only suggestion which offers itself is, that, owing to the high temperature to which they had been exposed, they retained a certain amount of abnormal heat in the same way that a salt which has been fused generally retains some of its heat of fusion. The difference in results, however, is but slight, and even if it were wholly without explanation, would by no means warrant us in concluding that there are modifications of potassium sulphate similar to those of the sodium salt.

Berthelot and Thomsen give — 5950 and — 6010 cal. respectively at 22·8° C., numbers somewhat lower than those given here; but it must be remembered that these chemists use only half the proportion of water (200H₂O) used by myself, and that, therefore, we may expect to find small differences in some cases due to this cause.

Lithium Sulphate.

The only existing determinations of the heat of dissolution of this salt is that of Thomsen, who gives (6054 and 6404) 6229 cal. for the value of the equation $\text{Li}_2\text{SO}_4 + 200\text{H}_2\text{O}$ at 19° C. (*J. pr. Chem.*, **17**, 171).

The following are the values which were obtained with different samples at 22·751° C. $\pm$ 0·05° :—

Specimen.	Molecular heat of dissolution.
1. Dehydrated at 100—110° (loses its water very slowly at this temperature)*.....	6467 cal.
2. Dehydrated at 200°	6563 „
3. Dehydrated, and then fused and powdered 12 hours before being dissolved	6512 „
Mean	6514 „

Thomsen's determinations reduced to this temperature give 6257 and 6525 cal. respectively.

Here, as in the case of potassium sulphate, we find no evidence of there being more than one modification of the salt.

* Crystallised lithium sulphate ($\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$) does not lose its water of crystallisation when exposed over sulphuric acid at ordinary temperatures.