

# The System, Water and the Nitrates of Potassium and Ammonium at 25.0°.

By

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(Received May 4, 1925)

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The nitrates of potassium and of ammonium form from their aqueous solutions two series of solid solutions with a gap.<sup>1</sup> As to the extent of the gap no data are found in the literature. Prof. Y. Osaka was in need of those data in the course of one of his investigations. In consequence the writer took up the study of the equilibrium of the system in question at 25°, and the results of his researches form the present article.

## EXPERIMENTAL.

Potassium nitrate of the Pharm. Jp. was thrice recrystallised, and ammonium nitrate (Puriss) of C. Merck twice recrystallised. Ordinary distilled water was used.

The materials in roughly calculated proportions were put in an Erlenmeyer flask of a capacity of about 30 cc. These salts were completely dissolved by warming and the flask, well stoppered, was made to rotate in a thermostat at 25°. When equilibrium was reached, the solution and residue were separated in the usual way, and the residue was made as free as possible from the mother liquor by pressing between folded filter paper.

Potassium was determined as potassium sulphate and ammonium volumetrically by the familiar methods. Water was calculated by difference.

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<sup>1</sup> Retgers, Zeits. physik. Chem., 4, 622 (1889).

## RESULTS.

The results are shown in Tables 1 and 2, and in Fig. 1. In Table 1 the composition of the liquid and of the solid phases is expressed in gram-percentage, and in Table 2 it is expressed in molar proportions by the following formula :



Fig. 1 is a graphical representation of the results, as given in Table 2, in the usual way.

Table 1.

No.	Liquid phase			Solid phase		
	NH <sub>4</sub> NO <sub>3</sub>	KNO <sub>3</sub>	H <sub>2</sub> O	NH <sub>4</sub> NO <sub>3</sub>	KNO <sub>3</sub>	H <sub>2</sub> O
1	0.00	27.86	72.14	—	—	—
2	13.48	23.53	62.99	1.74	93.51	4.75
3	25.56	21.38	53.06	3.59	94.11	2.30
4	39.45	19.27	41.28	7.71	90.36	1.93
5	51.16	16.90	31.94	30.30	66.77	2.93
6	51.57	16.92	31.51	39.25	58.38	2.37
7	51.56	16.69	31.75	58.75	38.82	2.43
8	54.80	13.95	31.25	67.25	30.08	2.67
9	59.93	8.62	31.45	80.40	17.80	1.80
10	61.41	7.26	31.33	83.97	13.79	2.24
11	65.63	2.71	31.66	93.44	4.98	1.58
12	67.70	0.00	32.30	—	—	—

Table 2.

No.	Liquid phase		Solid phase	
	<i>x</i>	<i>m</i>	<i>x</i>	<i>m</i>
1	0.00	14.53	—	—
2	41.99	8.72	2.29	0.28
3	60.16	5.55	4.60	0.13
4	72.11	3.35	9.73	0.11
5	79.27	2.21	36.43	0.16
6	79.37	2.16	45.92	0.12

Table 2 (continued).

No.	Liquid phase		Solid phase	
	<i>x</i>	<i>m</i>	<i>x</i>	<i>m</i>
7	79.60	2.18	65.65	0.12
8	83.22	2.11	73.85	0.13
9	89.77	2.09	85.09	0.08
10	91.44	2.07	88.49	0.10
11	96.84	2.08	95.96	0.07
12	100.00	2.12	—	—

As may be seen from the figure, the date of the salient points of the equilibrium system are as follows :

Solid potassium nitrate saturated with the ammonium salt,	<i>x</i>	<i>m</i>
	13.5	—
Solid ammonium nitrate saturated with the potassium salt,	65.0	—
Liquid solution saturated with the two salts,	79.41	2.18

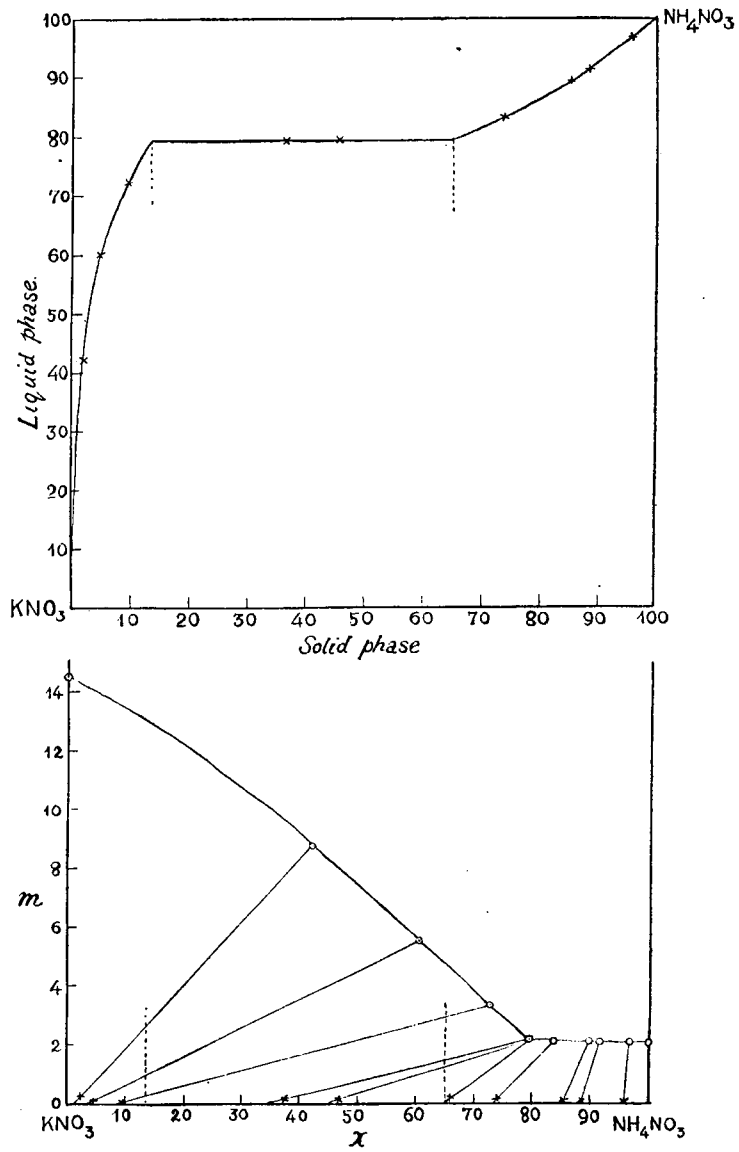


Fig. 1.