Conclusions.

The solubility of barium hydroxide in solutions of barium nitrate increases as the concentration of the latter increases. This fact is interesting, for in most cases a common ion tends to decrease the solubility of substances in solution in a common solvent.

The solid in equilibrium with any solution along curve AB, Fig. 1, is $Ba(OH)_2.8H_2O$, and along curve BC, is $Ba(NO_3)_2$.

Consequently, we conclude that basic nitrates of barium do not exist at 25°.

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THE SOLUBILITY OF STRONTIUM NITRATE AND STRONTIUM HYDROXIDE IN THE PRESENCE OF EACH OTHER.

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Received September 14, 1910.

In connection with the work described in the preceding paper on the solubility of barium nitrate in solutions of barium hydroxide it was decided to make a similar study of the strontium compounds and for the same reason. No basic nitrates of strontium have been described in the literature, but there was no certainty that a search along equilibrium lines might not reveal them.

A specially pure lot of strontium nitrate was prepared by separating the barium from a salt purchased as pure and containing no other contamination. Strontium hydroxide was prepared from pure strontium oxide by dissolving it in boiling water and filtering hot. Upon cooling the solution strontium hydroxide crystallized out and was preserved under the mother liquor. It was protected from the formation of carbonate by a sodium hydroxide seal.

A saturated solution of the nitrate was prepared and boiled with a slight excess of nitric acid to assure the absence of all carbonates. From this a series of solutions was made by diluting with freshly boiled, distilled water in varying amounts and adding the solid hydroxide until a solid phase persisted in sufficient quantity for analysis. One bottle also had excess of solid nitrate added and two bottles similarly prepared were made to contain hydroxide short of saturation. The solutions were placed in tightly stoppered bottles, the glass stoppers of which had been carefully ground, and rotated in a thermostat kept at 25° for more than a month before any analyses were made. Subsequent trials proved that equilibrium had already been attained.

Previous experimentation having shown that the methods used for barium in the research already referred to were applicable here, they were, accordingly, used. Definite portions of the solution were drawn off, weighed, acidified with nitric acid, evaporated to complete dryness

and the total strontium nitrate weighed as such. The hydroxide present was determined by titrating a separate portion with tenth normal nitric acid.

The data obtained are given in Table I, which (Nos. 1–22) shows the solubility of strontium hydroxide in solutions of strontium nitrate of various concentration; also (Nos. 24–25) the solubility of strontium nitrate in varying solutions of strontium hydroxide. No. 2 indicates the conditions that exist at the invariant point when the solution is saturated with both substances.

TABLE I.

Bottle No.	Sp. gr. 25/25.	SrO as $Sr(OH)_2$ in 100 grams H_2O.	$Sr(NO_3)_2$ in 100 grams H_2O.
1	1.481	0.0	79.27
2	1.506	1.76	81.06
3	1.490	1.71	74.27
4	1.450	1.55	66.88
5	1.419	1.51	63.71
6	1.403	1.47	60.37
7	1.381	1.41	56.30
8	1.359	1.34	52.90
9	1.327	1.27	46.97
10	1.317	1.20	44.03
11	1.291	1.14	40.83
12	1.267	1.11	37.81
13	1.239	1.03	32.41
14	1.217	1.01	28.80
15	1.206	0.96	26.58
16	1.178	0.95	23.83
17	1.148	0.91	17.96
18	1.126	0.87	16.21
19	1.108	0.84	12.78
20	1.079	0.81	8.96
21	1.059	0.79	6.29
22	1.033	0.78	4.45
24	1.492	0.38	79.47
25	1.494	0.78	80.83

The results are expressed graphically in Fig. 1.

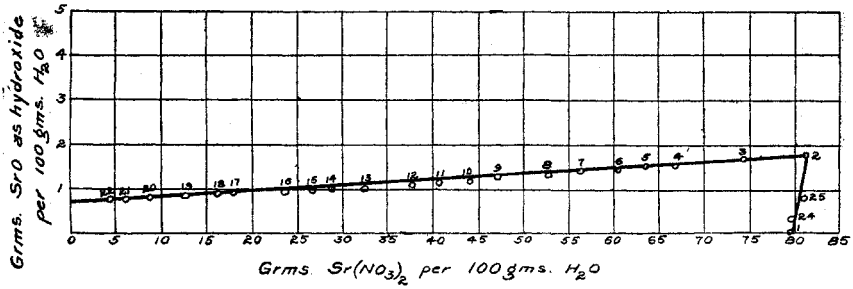

Fig. 1.

From an inspection of this chart it will be seen that there are only two distinct branches to the isotherm. As this is a three-component system, along each of these two branches there can be only one solid phase in equilibrium with the solution. Reference to the curve shows that the presence of either component increases the solubility of the other.

This curve in itself is sufficient to indicate the absence of any basic nitrate of strontium, since the composition of the solution varies with regularity. The precipitates were, however, examined through a microscope and several of them were analyzed. The microscope showed the crystals upon the first branch of the curve to be simply those of strontium hydroxide, while those upon the second branch were obviously strontium nitrate.

The analysis of the solids with adhering mother liquor was made as follows: The precipitate was spooned out in quantity sufficient for analysis, the adhering mother liquor was removed as completely as possible by pressing between filter papers and the solid was immediately placed in a closed weighing bottle and weighed. The alkalinity was determined by titrating with standard nitric acid. The total strontium was obtained as in the analysis of the solutions, by evaporation with slight excess of nitric acid. The composition of the solids analyzed together with that of the corresponding solutions is given in Table II.

TABLE II.

	Solution.		Solid.	
Bottle No.	Per cent. SrO.	Per cent. N_2O_5.	Per cent. SrO.	Per cent. N_2O_5.
3.....	21.65	21.52	37.86	1.65
8.....	17.66	17.49	38.61	0.56
19.....	6.27	5.76	38.92	0.19
24.....	21.86	22.54	36.50	38.00
25.....	22.02	22.70	36.98	38.48

An examination of these figures shows them to be entirely confirmatory of the solubility curve and that the only two solids present are $Sr(OH)_2.8H_2O$ and $Sr(NO_3)_2$.

Conclusions.

The solubility of strontium hydroxide in solutions of strontium nitrate increases as the concentration of the latter increases. The curve is similar in form to the curve for barium, but the solubility of the nitrate is much greater and the hydroxide much less than that of the corresponding barium salts.

The solid in equilibrium with any solution on the longer arm of the curve is $Sr(OH)_2.8H_2O$, while along the short arm it is $Sr(NO_3)_2$.

No basic nitrates of strontium exist at 25°.

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