By heating to a higher temperature for some time, a viscous, glassy fluid is formed. On cooling, it appears as a hard, brittle glass which is strongly acid in solution resembling the glacial metaphosphoric acid.

Finally, the solution of ammonium monometaphosphate similar to sodium precipitates the insoluble monometaphosphates of the heavy metals such as iron, copper, lead, etc. No precipitate, however, is produced on the addition of barium chloride to a solution acidified with a little nitric acid. An acidified solution coagulates albumin.

Summary

1. A new salt, ammonium monometaphosphate, has been prepared and some of its properties have been determined and compared to those of sodium monometaphosphate.

2. The monomolecular metaphosphates may enter into reactions of double decomposition when dissolved in water without undergoing polymerization.

3. The ammonium salt is the ammonium monometaphosphate.

The above conclusions are justified on the basis of: (*a*) quantitative analysis, (*b*) molecular-weight determinations, (*c*) analogous results from conductivity and hydration measurements to a known salt, (*d*) reactions attributed to the metaphosphate ion and metaphosphoric acid.

NEW YORK, N. Y.

[CONTRIBUTION FROM THE CHEMICAL LABORATORIES OF THE UNIVERSITY OF NEW HAMPSHIRE]

SOLUBILITIES OF RARE-EARTH SALTS. II

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This work was undertaken as mentioned in a separate publication,[1] in order to obtain full information in regard to the solubility curves of the bromates of those elements near to the element of atomic number 61 in solubility.

Preparation of the Bromates.—These salts, with the exception of that of praseodymium, were prepared by stirring the pure sulfates with an excess of pure barium bromate suspended in water. The praseodymium salt was obtained directly by the fractionation of praseodymium-neodymium bromates very rich in praseodymium. This method was found to be much superior to those usually employed for the separation of these elements.

The solubilities of the bromates of lanthanum, praseodymium, neodymium, samarium, gadolinium and terbium of the type $M(BrO_3)_3.9H_2O$

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[1] Cook, James and Fogg, *Proc. Nat. Acad. Sci.*, December, 1926.

were determined between 0° and 45° at intervals of 5°, using water as solvent. The results at each temperature with the exception of those for terbium were obtained by approaching the equilibrium from both directions. These duplicate values differed usually by less than 1%, and except for three or four values at the higher temperatures never differed by more than 1.5%. The values given in Table I are the average of these duplicate values.

Table I

Solubilities

Temp., °C.	$M(BrO_3)_3.9H_2O$, %	Parts of $M(BrO_3)_3.9H_2O$ per 100 parts of H_2O	Temp., °C.	$M(BrO_3)_3.9H_2O$, %	Parts of $M(BrO_3)_3.9H_2O$ per 100 parts of H_2O
Lanthanum Bromate			Samarium Bromate		
0	64.83	184.6	0	33.24	49.78
5	68.22	214.7	5	37.58	60.21
10	71.53	251.3	10	42.02	72.47
15	74.89	298.4	15	46.21	85.91
20	78.40	363.0	20	50.16	100.6
25	82.21	462.1	25	53.97	117.3
30	87.31	688.6	30	57.54	135.5
35	91.38	1061.5	35	61.12	157.2
			40	64.67	183.0
			45	68.16	214.1
Praseodymium Bromate			Gadolinium Bromate		
0	46.96	88.55	0	33.41	50.18
5	51.42	105.86	5	37.50	60.01
10	55.25	123.46	10	41.21	70.11
15	59.03	144.1	15	45.25	82.64
20	62.66	167.9	20	48.87	95.58
25	66.23	196.1	25	52.49	110.5
30	69.83	235.5	30	55.78	126.1
35	73.58	278.5	35	59.10	144.5
40	77.23	339.3	40	62.39	166.0
45	81.29	434.5	45	66.16	195.6
Neodymium Bromate			Terbium Bromate		
0	39.89	66.35	0	39.91	66.42
5	44.46	80.06	5	43.61	77.34
10	48.61	94.57	10	47.28	89.68
15	52.68	111.32	15	50.59	102.4
20	56.26	128.6	20	53.93	117.1
25	60.21	151.3	25	57.11	133.2
30	63.75	175.9	30	60.29	151.9
35	67.29	205.8	35	63.35	172.9
40	70.19	235.4	40	66.45	198.1
45	74.37	289.9	45	69.44	227.1

The curves obtained from the above data are shown in Fig. 1.

It can be observed from a study of the diagram that the curves for the members of the cerium group are of a similar type which differs from those of the terbium group.

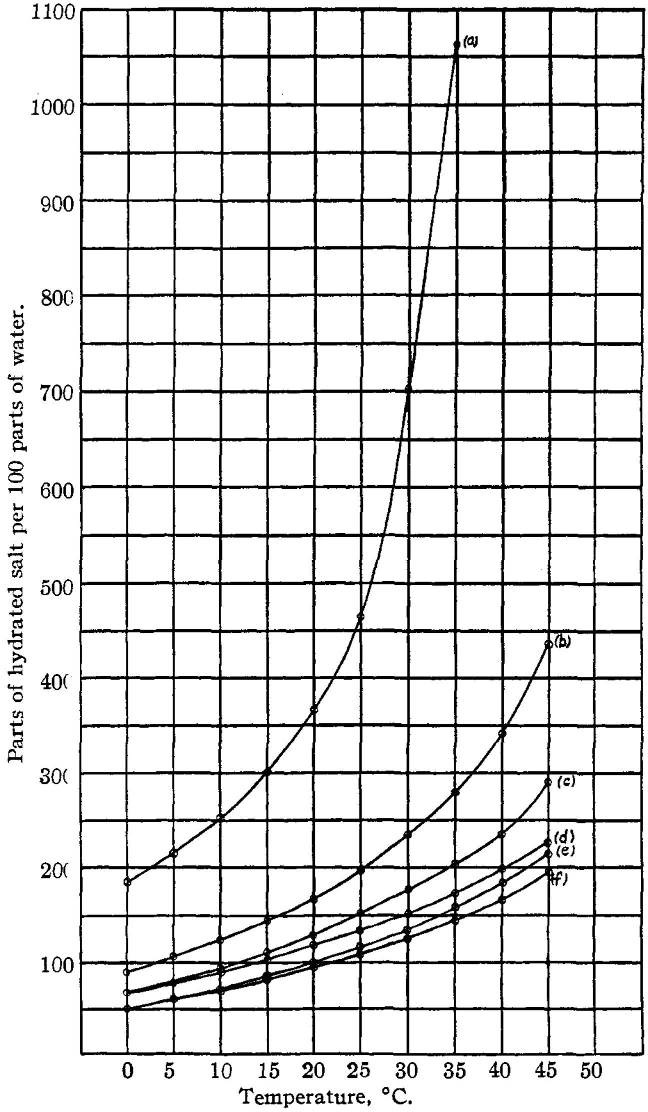

Fig. 1.—(*a*) $La(BrO_3)_3.9H_2O$; (*b*) $Pr(BrO_3)_3.9H_2O$; (*c*) $Nd(BrO_3)_3.9H_2O$; (*d*) $Tb(BrO_3)_3.9H_2O$; (*e*) $Sa(BrO_3)_3.9H_2O$; (*f*) $Gd(BrO_3)_3.9H_2O$.

All points on Curves *a*, *b*, *c*. *e* and *f* represent results obtained by approaching the equilibrium from both directions.

The points on Curve *d* were obtained by approaching the equilibrium from one direction only.

The authors desire to express their appreciation to the Committee of the Cyrus M. Warren fund for assistance in this work.

Summary

The solubilities of the hydrated bromates of lanthanum, praseodymium, neodymium, samarium, gadolinium and terbium of the type $M(BrO_3)_3 \cdot 9H_2O$ have been determined, using water as solvent.

The work upon the remaining bromates is being carried out.

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[Contribution from the Chemical Laboratories of the Ohio State University]

THE INFLUENCE OF CENTRIFUGAL FORCE ON RATE OF EVAPORATION

By Edward Mack, Jr.

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In his consideration of the mechanism of evaporation, Langmuir[1] has pointed out the probability that crystalline surfaces like those of iodine or naphthalene, when undergoing reversible evaporation, are partially covered with an amorphous layer. The amorphous layer is formed on the surface by the deposition of irregularly placed and loosely held molecules by condensation from the vapor phase. Such molecules stick where they strike and are somewhat slow to rearrange themselves to fit into the regular lattice structure of the crystalline surface. This view is strongly supported by experimental evidence brought forward in the present paper, based on the effect which centrifugal force has on the rate of evaporation of solid iodine.

Experimental Part

A small, high-speed centrifuge has been constructed, driven by a compressed-air turbine, 7.5 cm. in diameter, mounted on a vertical steel spindle pointed at the lower end, and arranged to spin like a top in an agate bearing. The upper part of the spindle turns in a ball-bearing socket. The spindle carries a steel frame, from which hang two tubes, like buckets, which assume horizontal positions when the centrifuge is in motion. The shape and dimensions of the buckets are indicated in Fig. 1. The entire centrifuge is mounted inside a large barrel with heavy concrete walls. The turbine is impelled by four nozzles, placed 90° apart and connected through control valves with a high-pressure air line. When the two buckets are loaded with water a speed somewhat greater than 9000 r.p.m. may be attained and when lighter buckets are attached, or none at all, a much greater speed has been reached.

The manner in which the rate of evaporation of iodine was determined is shown in Fig. 1.

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[1] Langmuir, This Journal, **38**, 2221 (1916).