COMPONENTS:

(1) Sodium carbonate; Na_2CO_3; [497-19-8]

(2) Sodium bromide; NaBr; [7647-15-6]

(3) Sodium bromate; $NaBrO_3$; [7789-38-0]

(4) Water; H_2O; [7732-18-5]

ORIGINAL MEASUREMENTS:

Klebanov, G.S.; Basova, E.P.

Zh. Prikl. Khim. 1939, *12*, 1601-9.

VARIABLES:

Composition at 353 K

PREPARED BY:

Hiroshi Miyamoto

EXPERIMENTAL VALUES: Composition of saturated solutions at 80°C

Sodium Bromide		Sodium Bromate		Sodium Carbonate		Nature of the solid phase[a]
mass %	mol % (compiler)	mass %	mol % (compiler)	mass %	mol % (compiler)	
52.67	16.56	-	-	1.05	0.321	A+B
48.20	15.79	6.60	1.47	1.18	0.375	A+B+C
52.20	17.77	6.25	1.45	-	-	A+C
29.82	8.596	12.26	2.410	4.66	1.30	B+C
17.05	4.728	17.09	3.232	9.34	2.51	"
10.81	2.939	19.18	3.556	11.80	3.115	"
-	-	21.88	4.013	18.84	4.919	"

[a] A = NaBr; B = $Na_2CO_3.H_2O$; C = $NaBrO_3$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Isothermal method. Prior to the experiment, the CO_2 content in water was checked with phenolphthalein. The salts and water were placed into a tube equipped with a stirrer, and the tube placed in a water thermostat. A layer of paraffin was placed on the surface of the water in the thermostat at 80°C. Equilibrium was reached in a day. The sodium bromate content was detd iodometrically by titrn with 0.1 mol dm^{-3} thiosulfate solution. The sodium bromide content was detd as follows: sulfurous acid was added to an aliquot of saturated sln, and the sln boiled to remove excess SO_2. The bromide was detd by Volhard's method using standard silver nitrate sln, and the sodium bromide content was obtained by difference. The sodium carbonate was detd by titrn with 0.1 mol dm^{-3}. Solid phase compositions detd by Schreinemakers' method, and by crystal optics.

SOURCE AND PURITY OF MATERIALS:

Analytical grade NaBr was used. The NaBr contained less than 0.2% NaCl. Chemically pure grade Na_2CO_3 was used. Sodium bromate was prepd as follows: (1) The reaction, $Br_2 + 5Cl_2 + 12NaOH = 2NaBrO_3 + 10NaCl + 6H_2O$, was used to prepare the sodium bromate. (2) Barium chloride was reacted with $KBrO_3$. The $Ba(BrO_3)_2$ obtained was treated with Na_2SO_4. The pptd $BaSO_4$ was removed by filtration and $NaBrO_3$ crystallized from the filtrate. The product was recryst to remove foreign ions.

ESTIMATED ERROR:

Nothing specified.

REFERENCES:

COMPONENTS:

(1) Sodium bromide; NaBr; [7647-15-6]

(2) Sodium bromate; $NaBrO_3$; [7789-38-0]

(3) Sodium hydrogen carbonate; $NaHCO_3$; [144-55-8]

(4) Water; H_2O; [7732-18-5]

ORIGINAL MEASUREMENTS:

Klebanov, G.S.; Basova, E.P.

Zh. Prikl. Khim. 1939, *12*, 1601-9.

VARIABLES:

Composition at 298 and 308 K

PREPARED BY:

Hiroshi Miyamoto

EXPERIMENTAL VALUES: Composition of saturated solutions

t/°C	Sodium Bromide mass %	mol % (compiler)	Sodium Bromate mass %	mol % (compiler)	$NaHCO_3$ mass %	mol % (compiler)	Nature of the solid phase[a]
25	47.91	13.95	-	-	0.44	0.16	A+B
	46.92	13.85	1.92	0.387	0.38	0.14	"
	46.20	13.74	3.06	0.621	0.42	0.15	A+B+C
	46.82	13.94	2.94	0.597	-	-	A+C
	39.07	10.79	4.44	0.836	0.62	0.21	B+C
	31.25	8.100	6.95	1.23	0.70	0.22	"
	27.96	7.091	8.09	1.40	0.98	0.30	"
	18.97	4.585	12.18	2.007	1.50	0.444	"
	10.08	2.387	17.44	2.816	3.04	0.882	"
	4.34	1.02	21.52	3.455	3.94	1.14	"
	-	-	24.34	3.884	4.76	1.36	"
35	49.20	14.59	-	-	0.48	0.17	A+B
	49.60	14.99	0.90	0.19	0.46	0.17	"
	48.82	14.79	1.78	0.368	0.46	0.17	"
	47.94	14.62	2.98	0.620	0.52	0.19	"
	47.79	14.59	3.20	0.666	0.50	0.19	A+B+C
	47.92	14.58	3.31	0.0687	-	-	A+C
	41.05	11.67	4.66	0.904	0.60	0.21	B+C
	33.85	9.066	6.92	1.264	0.78	0.26	"
	28.85	7.464	8.76	1.546	1.04	0.330	"
	17.48	4.310	15.12	2.542	1.60	0.483	"
	9.68	2.34	19.72	3.255	2.94	0.872	"
	-	-	28.02	4.679	4.88	1.464	"

[a] A = $NaBr.2H_2O$; B = $NaHCO_3$; C = $NaBrO_3$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Isothermal method. Prior to the experiment the CO_2 content in water was checked with phenolphthalein. The salt and water were placed in a tube equipped with a stirrer, and the tube thermostated at 25 or 35°C Equilibrium was reached in a day. The sodium bromate content was detd iodometrically by titrn with 0.1 mol dm^{-3} thiosulfate solution. The sodium bromide content was detd by adding sulfurous acid solution to an aliquot of saturated solution, and the solution boiled to remove excess SO_2. Bromide was detd by Volhard's method using standard $AgNO_3$ solution. The sodium bromide content was calcd by difference. The sodium hydrogen carbonate content was detd by titrn with 0.1 mol dm^{-3} HCl using methyl orange indicator. Solid phase compositions detd by Schreinemakers' method, and by crystal optics.

SOURCE AND PURITY OF MATERIALS:

Analytical grade sodium bromide and chemically pure grade $NaHCO_3$ were used. Sodium bromate was prepd as follows: (1) The reaction, $Br_2 + 5Cl_2 + 12NaOH = 2NaBrO_3 + 10NaCl + 6H_2O$, was used to prepare the sodium bromate. (2) Barium chloride was reacted with $KBrO_3$. The $Ba(BrO_3)_2$ obtained was treated with Na_2SO_4. The pptd $BaSO_4$ was removed by filtration and $NaBrO_4$ crystallized from the filtrate. The product was recrystallized to remove foreign ions.

ESTIMATED ERROR:

Nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Sodium Bromate; $NaBrO_3$; [7789-38-0] (2) N-Methylacetamide; C_3H_7NO; [79-16-3]	Dawson, L.R.; Berger, J.E.; Vaughn, J.W.; Eckstrom, H.C. *J. Phys. Chem.* 1963, *67*, 281-3.
VARIABLES:	**PREPARED BY:**
T/K = 313	Hiroshi Miyamoto and Mark Salomon

EXPERIMENTAL VALUES:

The solubility of $NaBrO_3$ in n-methylacetamide, $CH_3CONHCH_3$, at 40°C was given as

$$0.10 \text{ mol dm}^{-3}$$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

An "approximate" solubility was determined by the conductivity method. About 0.5 to 1.0 gram of salt and 10 ml of solvent were placed in a large test tube, stoppered and covered with aluminum foil, and heated to 60°C. Upon cooling to 40°C, the occurence of precipitation was assumed to indicate the existence of a saturated solution. Conductivities were measured in duplicate in "the usual manner." Experiental details and the measured electrolytic conductivities were not given.

The concentration of the salt in the saturated solution was determined from the experimental electrolytic conductivities, but details on the calculation were not given. Presumably the limiting law was used as in (1).

SOURCE AND PURITY OF MATERIALS:

N-Methylacetamide was prepared by reacting monoethylamine with glacial acetic acid and subsequent heating to distill off the water. The product was purified by fractional distillation followed by five or more fractional freezing cycles. The electrolytic conductance of the purified solvent ranged from 0.5×10^{-5} to 2×10^{-5} S cm^{-1}.

Reagent grade $NaBrO_3$ was dried in a vacuum desiccator over anhydrous magnesium perchlorate without further treatment.

ESTIMATED ERROR:

Soly: authors "believe" the solubility to be accurate to within 5 %.

Temp: not specified.

REFERENCES:

1. Dawson, L.R.; Wilhoit, E.D.; Holmes, R.R.; Sears, P.G. *J. Am. Chem. Soc.* 1957, *79*, 3004 (Λ^{∞} values are given in this paper).

COMPONENTS:

(1) Sodium bromate; $NaBrO_3$; [7789-38-0]

(2) Hydrazine; N_2H_4; [302-01-2]

ORIGINAL MEASUREMENTS:

Welsh, T.W.B.; Broderson, H.J.

J. Am. Chem. Soc. 1915, *37*, 816-24.

VARIABLES:

Room temperature (compiler's assumption)

PREPARED BY:

Mark Salomon and Hiroshi Miyamoto

EXPERIMENTAL VALUES:

The solubility of $NaBrO_3$ in hydrazine at room temperature was given as

$$0.01\ \text{g/ cm}^3\ N_2H_4$$

The authors stated that the chief object of the research was to obtain qualitative and approximate quantitative data, and the temperature was not kept constant.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility vessel has a glass tube to which a U-shaped capillary tube was attached to the bottom. A stopcock at the end of the capillary permitted the adjustment of the rate of flow of dry nitrogen. About 1 cc of anhydrous hydrazine was placed in the tube, and small amounts of $NaBrO_3$ added from a weighing bottle.
After each addition of $NaBrO_3$, a loosely fitting cork was placed in the top of the solubility tube. Nitrogen was bubbled through solution until the salt dissolved. The process was repeated until no more salt would dissolve. Temperature was not kept constant.

The accuracy of this method is very poor. In addition, the authors stated that it was difficult to prevent the oxidation of hydrazine.

SOURCE AND PURITY OF MATERIALS:

Anhydrous hydrazine was prepared by first partially dehydrating commercial hydrazine with sodium hydroxide according to the method of Rasching (1). Further removal of water by distn from barium oxide after the method of de Bruyn (2).
The type of distillation apparatus employed and the procedure followed in the respective distillations were those described by Welsh (3). The product was found on analysis to contain 99.7 % hydrazine. The hydrazine was stored in 50 cm^3 sealed tubes. Sodium bromate was the ordinary pure chemical of standard manufacture.

ESTIMATED ERROR:

Soly: accuracy ± 50 % at best (compilers).

REFERENCES:

1. Raschig, F. *Ber. Dtsch. Chem. Ges.* 1927, *43*, 1927.: Hale, C.F.; Shetterly, F.F. *J. Am. Chem. Soc.* 1911, 33, 1071.
2. de Bruyn, L. *Trav. Chim. Pays-Bas.* 1895, *14*, 458.
3. Welsh, T.W. *J. Am. Chem. Soc.* 1915, 37, 497.