COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lithium bromate; $LiBrO_3$; [13550-28-2] (2) 2-Propanone (acetone); C_3H_6O; [67-64-1]	Miravitlles, Mille L. *Ann. Fis. Quim. (Madrid)* 1945, *41*, 120-37.
VARIABLES:	**PREPARED BY:**
T/K = 288, 293 and 298	R. Herrera

EXPERIMENTAL VALUES:

	Solubility[a]	
t/°C	mass%	mol kg^{-1}
15	0.1013	0.007520
20	0.0897	0.006658
25	0.0803	0.005960

[a]Molalities calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Saturated solutions were prepared in an Erlenmeyer flask by mixing the dried acetone with an excess of halate for two hours. The solution was constantly stirred by bubbling dry air (air was dried by passing it through $CaCl_2$ while pumping it into the solution). Air going out from the flask after bubbling in the solution carried some acetone vapor during this operation. The solution temperature was kept constant by immersing the flask in a constant temperature water bath. After two hours, the air exit was closed. The resulting pressure forced the saturated solution from the Erlenmeyer through a tube filled with cotton which acted as a filter, and was collected in a small flask. This flask was stoppered and weighed. The halate contained in the sample was weighed after complete evaporation of acetone. In all cases, weights were reported to the fourth decimal figure.

SOURCE AND PURITY OF MATERIALS:

Commercial redistilled acetone. This acetone was then dehydrated three times by leaving it in contact with calcium chloride for forty eight hours each time. Fresh $CaCl_2$ was used in each operation. Finally, the dehydrated acetone was distilled at 56.3°C.

Source and purity of $LiBrO_3$ not specified.

ESTIMATED ERROR:

Nothing specified.

REFERENCES:

COMPONENTS:	EVALUATOR:
(1) Sodium Bromate; $NaBrO_3$; [7789-38-0]	H. Miyamoto Niigata University Niigata, Japan and M. Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	March, 1984

CRITICAL EVALUATION:

THE BINARY SYSTEM

The evaluators have examined seven publications (1-7) which report the solubility of $NaBrO_3$ in water. Linke and Seidell (8) cite three publications by Kremers (9), but the evaluators were unable to obtain copies of Kremers' papers. Upon detailed comparisons (see below), the solubilities reported by Kremers are all too large and were rejected.

A summary of the experimental solubilities is given in Table 1. In all cases the equilibrated solid phase is the anhydrous salt. It is noted that Linke and Seidell incorrectly attribute the experimental solubility at 373 K to Ricci (1) when in fact Ricci did not report any solubilities above 325 K, and the 373 K result must be from (9). Solubilities in mole kg^{-1} and mole dm^{-3} units are given in the compilations.

Table 1. Summary of Experimental Solubilities[a]

T/K	mass %	χ	(ref)	T/K	mass %	χ	(ref)
278.15	21.42	0.031519	(1)	308.15	31.35	0.051703	(1)
278.15	21.41	0.031501	(5)	308.2	31.95[b]	0.053080	(4)
283.15	23.24	0.034886	(1)	310.65	32.08[c]	0.053381	(2)
283.15	23.24	0.034886	(2)	313.15	32.80	0.055066	(1)
288.15	24.94	0.038157	(1)	318.15	34.22	0.058478	(1)
293.15	26.69	0.041657	(1)	318.15	34.22	0.058478	(2)
298.2	28.14[b]	0.044665	(4)	323.15	35.50	0.061660	(3)
298.15	28.26	0.044919	(5)	323.15	35.55	0.061787	(1)
298.15	28.29	0.044982	(1)	323.15	35.64	0.062015	(5)
298.15	28.29	0.044982	(3)	325.15	36.09	0.063162	(2)
298.15	28.29	0.044982	(6)	333.2	38.5[b,d]	0.06954	(9)
298.15	28.43[b]	0.045279	(7)	353.2	42.51	0.081121	(4)
303.15	29.85	0.048347	(1)	353.2	43.1[b,d]	0.08294	(9)
303.15	29.85	0.048347	(2)	373.2	47.6[b,d]	0.09784	(9)

[a]Original units are mass %. Mole fractions calculated by evaluators.

[b]Rejected data points. See text for discussion.

[c]Result obtained by graphical extrapolation.

[d]Results quoted from Ref. (8).

It is important to note that there are a number of entries in Table 1 from references (1-3, 5, 6) which are identical, and since the authors do not indicate that these identical solubilities are the result of the original study (1), the evaluators assume that these are all independent measurements which must be given equal weights. This is not a trivial point since by making the assumption that all data reported in (1-3, 5, 6) represent independent measurements, it is obvious that these data have greater weight in our least squares analyses (see below), and the consequence is that some data must be rejected. For example, the result at 298.15 K reported by Campbell et al. (7) had to be rejected which is somewhat of a surprise since Campbell's work is generally of high precision.

All solubility data in Table 1 were fitted to the smoothing equation

$$Y_x = A/(T/K) + B\ell n(T/K) + C + D(T/K) \qquad [1]$$

Data were rejected when the difference in the calculated and experimental solubilities exceeded twice the standard error of estimate.

COMPONENTS:	EVALUATOR:
(1) Sodium Bromate; $NaBrO_3$; [7789-38-0]	H. Miyamoto Niigata University Niigata, Japan and M. Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	March, 1984

CRITICAL EVALUATION:

Based on the criterion for exceptable data points, two data points from (4) were rejected, the singular data point at 298.15 K from (7) was rejected, and all data from (9) were rejected. Fitting the remaining 22 data points to the smoothing eq. [1] gives the following result for the mole fraction solubilities:

$$Y_x = -24576.69/(T/K) - 124.4405\ell n(T/K) + 735.8949 + 0.1698543(T/K) \quad [2]$$

$$\sigma_y = 0.0026 \qquad \sigma_x = 7.3 \times 10^{-5}$$

The solubilities calculated from this smoothing equation are designated as *recommended* values, and values at rounded temperatures are given in Table 2. It is interesting to note that we can also obtain a satisfactory fit to eq. [1] by including the melting point of 281 K for $NaBrO_3$ (10). Thus for 23 data points including the melting point of the solid, the following is obtained:

$$Y_x = -18558.18/(T/K) - 85.7656\ell n(T/K) + 513.8164 - 0.107927(T/K) \quad [3]$$

$$\sigma_y = 0.0033 \qquad \sigma_x = 8.9 \times 10^{-5}$$

For the 22 acceptable data points, the solubilities in mol kg^{-1} units were fitted to the following smoothing equation:

$$Y_m = -3893.57/(T/K) - 8.30776\ell n(T/K) + 60.39155(T/K) \quad [4]$$

$$\sigma_y = 0.0029 \qquad \sigma_m = 0.0089$$

The solubilities calculated from this smoothing equation are designated as *recommended* values, and values at rounded temperatures are given in Table 2.

Finally, for those publications which give density data (1, 2, 5, 6), we were able to calculate solubilities in mol dm^{-3} units (see the compilations). These solubilities were fitted to the following smoothing equation:

$$\ell n(c/\text{mol dm}^{-3}) = -5813.91/(T/K) - 15.3545\ell n(T/K) + 107.8469(T/K) \quad [5]$$

$$\sigma_c = 0.0070$$

Solubilities calculated from eq. [5] are designated as *recommended* solubilities, and values at rounded temperatures are given in Table 2.

MULTICOMPONENT SYSTEMS

Ternary systems of two saturating components of $NaBrO_3$ and an alkali metal halide are all of the simple eutonic type (1, 4). The $NaBrO_3$-NaBr-H_2O system was studied by both Ricci (1) and Klebanov and Basova (4), but direct comparisons cannot be made since the temperatures used differ in these studies.

The compilations should be consulted for other ternary systems involving sulfates (1, 2), halates (3, 5, 7) or sodium molybdate (6). A number of quaternary systems were reported in (4).

Note that the compilations of (3) and (7) can be found in the chapters on $NaClO_3$ and $LiBrO_3$, respectively.

COMPONENTS:	EVALUATOR:
(1) Sodium Bromate; $NaBrO_3$; [7789-38-0]	H. Miyamoto Niigata University Niigata, Japan and M. Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	March, 1984

CRITICAL EVALUATION:

Table 2. Recommended Solubilities Calculated from Eqs. [2], [4] and [5]. Solid Phase in all Cases is the Anhydrous Salt.

T/K	χ	m/mol kg^{-1}	c/mol dm^{-3}
278.15	0.03154	1.814	1.694
283.15	0.03484	2.003	1.864
288.15	0.03819	2.199	2.034
293.15	0.04157	2.400	2.204
298.15	0.04497	2.606	2.370
303.15	0.04837	2.815	2.533
308.15	0.05176	3.027	2.689
313.15	0.05513	3.235	2.839
318.15	0.05847	3.453	
323.15	0.06179	3.666	
328.15	0.06507	3.877	
333.15	0.06833	4.086	
338.15	0.07155	4.292	
343.15	0.07477	4.493	
348.15	0.07796	4.689	
353.15	0.08115	4.880	

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