COMPONENTS:	EVALUATOR:
(1) Rubidium iodate; $RbIO_3$; [13446-76-9] (2) Water; H_2O; [7732-18-5]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA June, 1986

CRITICAL EVALUATION:

THE BINARY SYSTEM

Data for the solubility of $RbIO_3$ in water have been reported in 15 publications (1-15). Publications (4-15) are studies of ternary systems using the isothermal method, and although some investigators (1-4, 14, 15) did not analyze the solid phase, the evaluators assume it to be the anhydrous salt by analogy to the solid phase found in studies on ternary systems in (5-13). The compilations for references (6,7) are given in the $LiIO_3$ chapter, for (12) in the $NaIO_3$ chapter, for (4) in the KIO_3 chapter, and for ref. (13) dealing with the $RbIO_3$-$Mg(IO_3)_2$-H_2O system in the first volume on Alkaline Earth Metal Halates (16).

Analyses of saturated solutions varied: iodometric titration was used in (3-12), the Carius method in (1), gravimetry with sodium tetraphenylborate in (5-10) or with sulfate in (2), and flame photometry in (4).

A summary of the solubilities reported in (1-15) is given in Table 1. The results for the approximate temperature of 296 K in (1,2) were rejected as was the obviously high solubility at 323 K reported in (5). The low solubility of 0.00163 mole fraction at 298 K reported in (4) was rejected on the usual basis of its poor fit to the smoothing equations. The remaining data were fitted to the two smoothing equations based on mole fraction and mol/kg solubilities, and the respective results are:

$$Y_x = -27922/(T/K) - 131.152 \ln (T/K) + 776.99 + 0.18259(T/K)$$

$$\sigma_y = 0.016 \qquad \sigma_x = 1.4 \times 10^{-5}$$

and

$$Y_m = -4381/(T/K) - 6.236 \ln (T/K) + 50.222$$

$$\sigma_y = 0.012 \qquad \sigma_m = 0.0017$$

All solubilities calculated from the smoothing equations are designated as *recommended* values.

TERNARY SYSTEMS

1. One saturating component.

Solubilities of $RbIO_3$ in aqueous KNO_3 solutions and in dilute HNO_3 solutions at 298.2 K have been reported by Larson and Renier (14). The solubility of $RbIO_3$ increases with increasing concentration of KNO_3, but in HNO_3, the solubility first increases and reaches a maximum of around 0.16 mol dm^{-3} at an acid concentration of around 0.3 mol dm^{-3}.

2. Two saturating components.

Solubilities in aqueous solutions containing a second saturating component in addition to $RbIO_3$ have been reported in 10 publications (4-13), and all studies used the isothermal method. A summary of the various ternary systems studied is given in Table 3.

The ternary system $RbIO_3$-$RbOH$-H_2O is of the simple eutonic type (8), but the dominant features in the ternary systems with HIO_3 (5) and $LiIO_3$ (6) are the formation of the double salts $RbIO_3.2HIO_3$ and $RbIO_3.2LiIO_3$. No double salts were found in the remaining ternary systems.

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H. Miyamoto
Niigata University
Niigata, Japan
and
Mark Salomon
US Army ET & DL
Fort Monmouth, NJ, USA

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CRITICAL EVALUATION:

Table 1. Summary of solubilities in the $RbIO_3$-H_2O system[a]

T/K	mol kg^{-1}	mole fraction	ref
273.2	0.0411	0.000741	3
283.2	0.0609	0.001053	3
293.2	0.0828	0.00149	3
293.2	0.0811	0.00146	15
296[a]	0.0806	---	1
296.2[a]	0.081	---	2
298.2[a]	0.0908	0.00163	4
298.2	0.0926[b]	0.00167	14
298.2	0.0928	0.00167	7
298.2	0.0940	0.00169	8
298.2	0.0940	0.00169	9
298.2	0.0943	0.00170	15
298.2	0.0944	0.00170	11
298.2	0.0948	0.00171	3
303.2	0.107	0.00193	3
303.2	0.109	0.00196	15
313.2	0.139	0.00250	3
323.2	0.176	0.00315	3
323.2	0.176	0.00317	6,10
323.2	0.176	0.00317	12,13
323.2[a]	0.223	0.00400	5
333.2	0.220	0.00394	3
343.2	0.266	0.00477	3
353.2	0.320	0.00574	3
363.2	0.380	0.00680	3
373.2	0.449	0.00802	3

[a]Rejected data points.

[b]Calculated by the evaluators using a density of 1.016 g/cm^3.

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CRITICAL EVALUATION:

Table 2. Smoothed solubilities from 273-373 K[a]

T/K	mol/kg[b]	mole fraction
273.2	0.0422	0.00074
278.2	0.0503	0.00089
283.2	0.0595	0.00106
288.2	0.0697	0.00125
293.2	0.0812	0.00146
298.2	0.0938	0.00169
303.2	0.108	0.00194
313.2	0.140	0.00251
323.2	0.177	0.00317
333.2	0.220	0.00392
343.2	0.268	0.00477
353.2	0.322	0.00573
363.2	0.380	0.00681
373.2	0.444	0.00802

[a]All data in this table are designated as *recommended*.

[b]Reference molality used in the smoothing equation is 0.094 mol/kg.

Table 3. Summary of solubility studies in ternary systems

Ternary system	T/K	Solid phase	Reference
$RbIO_3$ - KIO_3 - H_2O	298	Not given	4
$RbIO_3$ - $CsIO_3$ - H_2O	298	Not given	4
$RbIO_3$ - HIO_3 - H_2O	323	$RbIO_3$; HIO_3; $RbIO_3.2HIO_3$	5
$RbIO_3$ - $LiIO_3$ - H_2O	323	$RbIO_3$; $LiIO_3$; $2LiIO_3.RbIO_3$	6
$RbIO_3$ - $LiIO_3$ - H_2O	298	$RbIO_3$; $LiIO_3$; $RbIO_3.2LiIO_3$	7
$RbIO_3$ - $RbOH$ - H_2O	298	$RbIO_3$; $RbOH.2H_2O$	8
$RbIO_3$ - $Al(IO_3)_3$ - H_2O	298	$RbIO_3$; $Al(IO_3)_3.6H_2O$	9
$RbIO_3$ - $Zn(IO_3)_2$ - H_2O	323	$RbIO_3$; $Zn(IO_3)_3.2H_2O$	10
$RbIO_3$ - $Nd(IO_3)_2$ - H_2O	298	$RbIO_3$; $Nd(IO_3)_3.2H_2O$	11
$RbIO_3$ - $NaIO_3$ - H_2O	323	$RbIO_3$; $NaIO_3.H_2O$	12
$RbIO_3$ - $Mg(IO_3)_2$ - H_2O	323	$RbIO_3$; $Mg(IO_3)_2.4H_2O$	13

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CRITICAL EVALUATION:

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