COMPONENTS:	EVALUATOR:
(1) Cesium iodate; $CsIO_3$; [13434-81-4]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	June, 1986

CRITICAL EVALUATION:

THE BINARY SYSTEM

Data for the solubility of $CsIO_3$ in water have been reported in 12 publications (1-12). A number of compilations containing solubilities in the binary system can be found elsewhere in this volume: ref. (4) has been compiled in the KIO_3 chapter, ref. (5) is in the $RbIO_3$ chapter, refs. (7, 8) are in the $LiIO_3$ chapter, and ref. (11) is in the $NaIO_3$ chapter.

Although some investigators (1-3, 5, 12) did not report the nature of the solid phase in the binary system, the evaluators assume it to be the anhydrous salt by analogy to the anhydrous salt found in studies on ternary systems.

A summary of the experimental data converted to mole fraction and mol/kg units by the evaluators and compilers is given in Table 1. In fitting these data to the smoothing equations, it was assumed that there are 24 independent data points to be considered as indicated in the table although it appears that Barker (2) may have used the earlier value reported in (1). In any case, these two data points were rejected on the bases of the uncertainty in experimental temperature (about 297 K), and the fact that their results are close to the experimental values reported by other investigators for 298.2 K. All other data (22 independent values) were used in the smoothing equations, and for mole fraction solubilities the smoothing equation is:

$$Y_x = -26800/(T/K) - 118.503\ \ell n\ (T/K) + 706.355 + 0.15820(T/K)$$

$$\sigma_y = 0.032 \qquad \sigma_x = 3.2 \times 10^{-5}$$

For solubilities in mol/kg units, the smoothing equation is:

$$Y_m = -5309.8/(T/K) - 8.4748\ \ell n\ (T/K) + 66.085$$

$$\sigma_y = 0.019 \qquad \sigma_m = 0.0026$$

The smoothed solubilities at rounded temperatures calculated from these two equations are given in Table 2, and these values are designated as *recommended* solubilities.

TERNARY SYSTEMS

Data for the solubilities in ternary systems with two saturating components have been reported in 8 publications (4-11). A summary of these studies is given below.

Summary of solubility studies in aqueous ternary systems

Ternary system	T/K	Solid Phase	Reference
$CsIO_3$ - KIO_3 - H_2O	298	$CsIO_3$; KIO_3	4
$CsIO_3$ - $RbIO_3$ - H_2O	298	Not given	5
$CsIO_3$ - HIO_3 - H_2O	298	$CsIO_3$; HIO_3; $CsIO_3.HIO_3$	6
$CsIO_3$ - $LiIO_3$ - H_2O	298	$CsIO_3$; $LiIO_3$	7
$CsIO_3$ - $LiIO_3$ - H_2O	323	$CsIO_3$; $LiIO_3$	8
$CsIO_3$ - $CsNO_3$ - H_2O	323	$CsIO_3$; $CsNO_3$	9
$CsIO_3$ - $Al(IO_3)_3$ - H_2O	298	$CsIO_3$; $Al(IO_3)_3.6H_2O$	10
$CsIO_3$ - $NaIO_3$ - H_2O	323	$CsIO_3$; $NaIO_3.H_2O$	11

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CRITICAL EVALUATION:

The System With Iodic Acid. This ternary system was studied by Tatarinov (6), and the dominant feature is the formation of the double salt, $CsIO_3.HIO_3$.

Systems With Other Iodates. Other ternary systems were reported in 7 publications (4, 5, 7-11). Kirgintsev, Shklovskaya and Arkhipov (5) measured solubilities in the ternary $CsIO_3$-$RbIO_3$-H_2O system at 298 K, but did not report the composition of the solid phases. In other publications (4, 7-11), no double salts were reported, and all systems studied were of the simple eutonic type.
The $CsIO_3$-$CsNO_3$-H_2O system is similar to the systems described in this section, that is, no double salts were formed and this system is of the simple eutonic type.

Table 1. Experimental solubilities in the $CsIO_3$-H_2O system

T/K	mole fraction	mol/kg	reference
273.2	0.00633	0.0351	3
283.2	0.00933	0.0518	3
293.2	0.00137	0.0761	3
293.2	0.00135	0.0750	12
297[a]	0.00152	0.084	1
297[a]	0.00156	0.0844	2
298.2	0.00157	0.0874	3
298.2	0.00150	0.0833	5
298.2	0.00152	0.0843	4
298.2	0.00154	0.0857	12
298.2	0.00157	0.0871[b]	7,10
298.2	0.00160	0.0891	6
303.2	0.00180	0.100	3
303.2	0.00180	0.0998	12
313.2	0.00243	0.135	3
323.2	0.00310	0.173	3
323.2	0.00312	0.174	8
323.2	0.00312	0.174	9
323.2	0.00312	0.174	11
333.2	0.00385	0.215	3
343.2	0.00481	0.268	3
353.2	0.00581	0.324	3
363.2	0.00707	0.395	3
373.2	0.00835	0.468	3

[a]Rejected data points.

[b]Reference molality used in the smoothing equation.

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CRITICAL EVALUATION:

Table 2. Recommended solubilities in the binary $CsIO_3$-H_2O system calculated from the smoothing equations

T/K	mole fraction	mol/kg
273.2	0.000633	0.0355
283.2	0.000938	0.0521
293.2	0.00133	0.0735
298.2	0.00156	0.0863
303.2	0.00182	0.101
313.2	0.00240	0.134
323.2	0.00310	0.173
333.2	0.00390	0.218
343.2	0.00482	0.271
353.2	0.00586	0.329
363.2	0.00703	0.393
373.2	0.00835	0.462

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