COMPONENTS:	EVALUATOR:
(1) Ammonium iodate; NH_4IO_3; [13446-09-8]	Hiroshi Miyamoto
(2) Water; H_2O; [7732-18-5]	Department of Chemistry Niigata University Niigata, Japan
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CRITICAL EVALUATION:

THE BINARY SYSTEM

Data for the solubility of NH_4IO_3 in water were reported in 6 publications (1-6). The study of Opalovskii and Kuznetsova (2) deals with the solubility of ammonium iodate in water at various temperatures. The remaining five studies (1, 3-6) deal with ternary systems, and the solubility in the binary system is given as 1 point on a phase diagram.

In the five publications dealing with ternary systems (1, 3-6), the stable solid phase in equilibrium with the saturated solutions was simply anhydrous ammonium iodate. The composition of the solid phase was determined by Schreinemakers' method of residues (1, 3, 5, 6), by X-ray diffraction, thermography, and infrared spectroscopy (5). Opalovskii and Kuzunetsova (2) reported the existence of $NH_4IO_3.0.75H_2O$ crystals which was determined by thermogravimetry and X-ray analysis, but this result has not been confirmed by any other investigator.

In many cases, the iodate content was determined by iodometric titration, and the determination of the ammonium content was carried out by a distillation method (2, 4). Other studies employed the bromate method (3) and gravimetry using sodium tetraphenylborate (5, 6).

EVALUATION OF DATA

Some investigators reported the solubility in mass % units which the evaluator converted to units of mol kg^{-1} using 1977 IUPAC recommended atomic masses. Opalovskii and Kuznetsova (2) reported the solubility of NH_4IO_3 in terms of the I_2O_5 content, and the evaluator made the conversions to mol kg^{-1} units.

Solubility at 298.2 K. The solubility has been reported in 4 publications (2, 4-6). In 2 publications by Tarasova, Vinogradov and Lepeshkov (5, 6), identical solubility values of 0.200 mol kg^{-1} were reported. The data of Opalovskii and Kuznetsova (2) were rejected, and the arithmetic mean of 2 independent results from (4, 5), and for which the solid phase is NH_4IO_3, is 0.199 mol kg^{-1}. This mean is designated as a recommended value.

Solubility at 303.2 K. Only one value of 0.227 mol kg^{-1} was reported by Meerburg (1), and the composition of the stable solid was NH_4IO_3. The value of 0.227 mol kg^{-1} is designated as a tenative result.

Solubility at 323.2 K. The solubility has been reported in 2 publications (2, 3). The value of Opalovskii and Kuznetsov (2) is 0.389 mol kg^{-1}, and that of Tatrinov (3) is 0.428 mol kg^{-1}. The difference between two reported data is large. The solid phase reported in the former study was $NH_4IO_3.0.75H_2O$, and that of the latter author was NH_4IO_3. Therefore, the evaluator is unable to average these two values. The result of Tatarinov is designated as a tentative value because their identification of an anhydrous solid phase is consistent with most other data at various temperatures. The results from (2) are rejected.

The recommended and tentative values of solubilities of ammonium iodate in water are given in Table 1.

Table 1. Recommended and tentative solubilities in the binary NH_4IO_3-H_2O system

T/K	m_1/mol kg^{-1}	Solid phase
298.2[a]	0.199	NH_4IO_3
303.2	0.227	"
323.2	0.428	"

[a]Recommended value

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CRITICAL EVALUATION:

TERNARY SYSTEMS

The data for the solubility in ternary systems were reported in 4 publications (3-6). The phase diagrams of the ternary systems, NH_4IO_3-NH_4F-H_2O (4) and NH_4IO_3-$Mg(IO_3)_2$-H_2O (6) are simple eutonic types, and no double salts are formed.

The dominant feature in the ternary systems NH_4IO_3-HIO_3-H_2O (3) and NH_4IO_3-$LiIO_3$-H_2O (5) is the existence of double salts of the type $NH_4IO_3.2MIO_3$ (M = H, Li).

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