COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	January 1985

CRITICAL EVALUATION:

THE BINARY SYSTEM

Data for the solubility of $NaIO_3$ in water have been reported in 19 publications (1-19). Note that the compilation for reference (16) is given in the $LiIO_3$ chapter, and the compilation for reference (18) is given in the previous volume on alkaline earth metal halates (Vol. 14 of the *IUPAC SOLUBILITY DATA SERIES*, ref. (20)). Several authors appear to report the same solubilities in two or more publications, and these values have been treated as a single independent measurement (details are given in the text below). Many of the studies deal with ternary systems, and the solubility in the binary system was given as one point on a phase diagram. Depending upon temperature and composition, three solid phases have been identified in the binary system:

$NaIO_3.5H_2O$ [17250-90-7]

$NaIO_3$ [7681-55-2]

$NaIO_3H_2O$ [22451-04-7]

The temperature dependence of the solubility of $NaIO_3$ in pure water has been studied by Foote and Vance (2) over the range 273.2 - 363.5 K, and by Cornec and Spack (8) over the range 273.2 - 373.2 K. Both studies reported the existence of the three solid phases, and transition temperatures were determined graphically. Foote and Vance (2) reported the pentahydrate → monohydrate transition temperature as 293.1 K, and the monohydrate → anhydrate transition temperature as 346.6 K. These two temperatures are in good agreement with those of Cornec and Spack, but they differ from the evaluators' recommended values evaluated graphically below (293.2 K and 347.4 K). The monohydrate → pentahydrate transition temperature of 295 K reported by Hill and Donovan (6) appears too high and should be rejected

The solubility data reported by Foote and Vance (2) and by Cornect and Spack (8) are plottted as a function of temperature in Figure 1.

In evaluating the solubility data for the binary system, each polytherm in the phase diagram was separately fitted to a smoothing equation. For mole fraction solubilities the following smoothing equation was used,

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

and for molalities, the following smoothing equation was used

$$Ym = A/(T/K) + B\ell n(T/K) + C \qquad [2]$$

The complex Y terms in eqs. [1] and [2] are defined in the PREFACE to this volume and in the critical evaluations for $LiClO_3$ and $RbClO_3$. Solubility data were rejected when the difference between the calculated and observed mole fraction solubilities exceeded twice the standard error of estimate: i.e. when

$$\text{abs}\,[\chi_{obsd} - \chi_{calcd}] > 2\sigma_x \qquad [3]$$

Polytherm For $NaIO_3.5H_2O$ As The Solid Phase

A summary of the experimental data is given in Table 1. The identical solubility at 273.2 K reported by Foote and Vance in three publications (2, 3, 10) was treated as one independent measurement, and therefore 17 independent data points were used in the smoothing equations. No data points were rejected. Mole fraction solubilities were fitted to

$$Yx = -150902/(T/K) - 1053.291\ell n(T/K) + 1.95591(T/K)$$

$$\sigma_y = 0.011 \qquad \sigma_x = 2.9 \times 10^{-5}$$

COMPONENTS:	EVALUATOR:
(1) Sodium Iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	January, 1985

CRITICAL EVALUATION:

For mol/kg solubilities, the following smoothed relation was obtained:

$$Y_m = 4070.9/(T/K) + 31.360\ell n(T/K) - 191.440$$

$$\sigma_y = 0.0061 \qquad \sigma_m = 0.0019$$

Solubilities calculated from these equations are designated as recommended, and recommended fraction solubilities are given in Table 4 at the end of this evaluation.

Table 1. Experimental Solubilities in the Binary $NaIO_3.5H_2O$-H_2O System

T/K	mole fraction	mol/kg^{-1}	ref
272.8[a]	0.002215	0.1232	2
273.2	0.002253	0.1253	2,3,10
273.2	0.002281	0.1269	8
278.2	0.003097	0.1724	6
278.2	0.003078	0.1714	7
281.2	0.003681	0.2051	4
281.2	0.003671	0.2045	9
283.2	0.004172	0.2326 [c]	2
283.2	0.004212	0.2348	8
288.2	0.005665	0.3163	2
288.2	0.005655	0.3157	3
288.2	0.005625	0.3140	6
288.2	0.005706	0.3185	8
288.2	0.005625	0.3140	11
288.2	0.005645	0.3151	14
293.0[b]	0.007674	0.4293	2
293.2[b]	0.007653	0.4281	6

[a]Solid phase: ice + $NaIO_3.5H_2O$

[b]Solid phase: $NaIO_3.5H_2O$ + $NaIO_3.H_2O$ [c]Reference molality used in the smoothing eqn.

Polytherm For $NaIO_3.H_2O$ As The Solid Phase

Table 2 lists the solubilities at various temperatures given in 52 references, and which we have treated as representing 35 independent measurements. In fitting these 35 solubility values to the smoothing equations, five points were rejected as indicated in Table 2. The remaining 30 solubility values yielded the following:

$$Y_x = 3187.5/(T/K) + 45.366\ \ell n\ (T/K) - 254.20 - 0.07121(T/K)$$

$$\sigma_y = 0.012 \qquad \sigma_x = 7.2 \times 10^{-5}$$

For mol/kg solubilities, the smoothed data are given by

$$Y_m = -1620.6/(T/K) + 1.394\ \ell n\ (T/K) - 2.496$$

$$\sigma_y = 0.006 \qquad \sigma_m = 0.004$$

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	January, 1985

CRITICAL EVALUATION:

Solubilities calculated from these two smoothing equations are designated as *recommended* and recommended mole fraction solubilities are given in Table 4 at the end of this critical evaluation.

Table 2. Solubilities in the Binary $NaIO_3$.H_2O-H_2O System

T/K	mole fraction	mol/kg	ref
278.2[m]	0.005249	0.2929	10
293.0[a]	0.007674	0.4293	2
293.2[a]	0.007653	0.4281	6
293.2	0.007695	0.4305	2
293.2	0.007661	0.4257	8
295.0	0.000797	0.4460	6
298.2	0.008557	0.4791	2,5,10,15,16,19
298.2	0.008568	0.4797	6,9
298.2	0.008461	0.4737	7,12
298.2	0.008460	0.4736	11
298.2[b]	0.008375	0.4688	13
298.2[c]	0.008472	0.4743[e]	18
302.7	0.009433	0.5286	5
303.2[b]	0.009313	0.5218	1
303.2	0.009608	0.5385	2
303.2	0.009608	0.5385	8
308.2	0.01065	0.5973	2-5
308.2	0.01066	0.5979	6,11
313.2	0.01193	0.6702	2,10
313.2	0.01192	0.6696	6,9,11
313.2	0.01185	0.6657	8
318.2	0.01322	0.7438	11
323.2	0.01468	0.8267	2
323.2	0.01468	0.8267	5,10
323.2	0.01454	0.8192	6
323.2[b]	0.01400	0.7880	7,11,12
323.2	0.01448	0.8158	8
323.2[b]	0.01403	0.7901	17
331.0	0.01694	0.9568	2
333.2	0.01786	1.0094	8
342.8	0.02095	1.1876	2
343.2	0.02123	1.2039	8
346.6[b,d]	0.02225	1.2633	2
352.2[m]	0.02479	1.4112	2
353.2[m]	0.02529	1.4403	8

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	January, 1985

CRITICAL EVALUATION:

[m]metastable

[a]Solid phase: $NaIO_3.5H_2O$ + $NaIO_3.H_2O$

[b]Rejected data points

[c]Compilation of data in ref. 18 given in the earlier volume (20).

[d]Solid phase $NaIO_3.H_2O$ + $NaIO_3$ [d]Reference molality used in the smoothing eqn.

Polytherm For Anhydrous $NaIO_3$ As The Solid Phase

The ten solubilities reported for anhydrous $NaIO_3$ (anhydrate) are given in Table 3, and all ten data points were successfully fitted to the smoothing equations. The resulting equations are:

$$Y_x = -75335.5/(T/K) - 421.305\ \ell n\ (T/K) + 2464.25 + 0.60793(T/K)$$

$$\sigma_y = 0.012 \qquad \sigma_x = 1.5 \times 10^{-4}$$

for the mole fraction solubilities, and

$$Y_m = 1498.1/(T/K) + 7.780\ \ell n\ (T/K) - 49.896$$

$$\sigma_y = 0.006 \qquad \sigma_m = 0.009$$

for mol/kg solubilities. *Recommended* mole fraction solubilities calculated from the smoothing equation are given in Table 4.

Table 3. Experimental Solubilities in the Binary $NaIO_3$-H_2O System

T/K	mole fraction	mol/kg	ref
340.2[m]	0.02096	1.188	2
343.2[m]	0.02166	1.229	2
346.6[a]	0.02225	1.263	2
349.0	0.02292	1.302	2
353.2	0.02398	1.364[b]	8
353.8	0.02396	1.363	2
360.8	0.02535	1.444	2
363.2	0.02628	1.498	8
363.5	0.02652	1.512	2
373.2	0.02900	1.658	8

[m]metastable

[a]$NaIO_3.H_2O$ + $NaIO_3$

[b]Reference molality used in the smoothing equation.

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan and Mark Salomon US Army ET & DL Fort Monmouth, NJ, USA
(2) Water; H_2O; [7732-18-5]	January, 1985

CRITICAL EVALUATION:

Recommended Solubilities In The Binary System

Table 4 lists recommended solubilities over the temperature range of 273 K to 373 K as calculated from the mole fraction smoothing equations. The transition points included in this table were evaluated graphically by the evaluators using the smoothed solubilities.

Table 4. Recommended Mole Fraction Solubilities[a]

T/K	$NaIO_3.5H_2O$	$NaIO_3.H_2O$	$NaIO_3$
273.2	0.002266		
278.2	0.003080	0.005265[m]	
283.2	0.004173	0.005974[m]	
288.2	0.005656	0.006755[m]	
293.2	0.007626	0.007613[m]	
293.22	0.00763[b]	0.00763[b]	
298.2		0.008551	
303.2		0.009574	
308.2		0.01069	
313.2		0.01189	
318.2		0.01319	
323.2		0.01459	
328.2		0.01610	
333.2		0.01770	
338.2		0.01942	0.0205[m]
343.2		0.02124	0.0216[m]
347.4		0.0220[b]	0.0220[b]
348.2		0.02318[m]	0.0227
353.2		0.02523[m]	0.0238
358.2		0.02738[m]	0.0250
363.2			0.0263
368.2			0.0276
373.2			0.0290

[a]Calculated from the smoothing equations

[b]Phase transitions determined graphically by evaluators.

[m]metastable

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan
(2) Water; H_2O; [7732-18-5]	June, 1984

CRITICAL EVALUATION:

TERNARY SYSTEMS

Many studies for solubilities in ternary aqueous systems with two saturating components have been reported. Summaries of these studies are given in Tables 5-8.

The System With Iodic Acid.

This system was studied by Meerburg (1) at 303 K and Shibuya and Watanabe (14) at 288 K. The compositions of the solid phase obtained are as follows:

$NaIO_3.1.5H_2O$; HIO_3; $Na_2O.2I_2O_5$; $NaIO_3.2HIO_3$ (1)

$NaIO_3.5H_2O$; $2NaIO_3.I_2O_5$; $NaIO_3.I_2O_5$ (14)

Many solubility studies at 303 K reported the solid phase of $NaIO_3.H_2O$, but did not report $NaIO_3.1.5H_2O$. Solid HIO_3 was not reported in (14). The compositions of the double salts appear doubtful, and the evaluator is of the opinion that additional studies are required to confirm the compositions of the various solid phases.

System With Other Iodates

Solubilities in ternary aqueous systems containing sodium iodate with other iodates have been reported in 6 publications (7, 15-19) (see Table 5). No double salts were found in these systems as all are of the simple eutonic type. The sodium salt in the solid phase at 278 K is the pentahydrate, and that at 298 and 323 K is the monohydrate.

Table 5. Summary of solubility studies of ternary systems with sodium iodate and other iodates

Ternary System	T/K	Solid Phase	Reference
$NaIO_3 + LiIO_3 + H_2O$	298	$NaIO_3.H_2O$; $LiIO_3$	15
$NaIO_3 + KIO_3 + H_2O$	278	$NaIO_3.H_2O$; KIO_3	7
$NaIO_3 + KIO_3 + H_2O$	298,323	$NaIO_3.H_2O$; KIO_3	7
$NaIO_3 + RbIO_3 + H_2O$	323	$NaIO_3.H_2O$; $RbIO_3$	17
$NaIO_3 + CsIO_3 + H_2O$	323	$NaIO_3.H_2O$; $CsIO_3$	17
$NaIO_3 + Mg(IO_3)_2 + H_2O$	278	$NaIO_3.5H_2O$; $Mg(IO_3)_2.10H_2O$	7
$NaIO_3 + Mg(IO_3)_2 + H_2O$	298,323	$NaIO_3.H_2O$; $Mg(IO_3)_2.4H_2O$	7
$NaIO_3 + Ca(IO_3)_2 + H_2O$	298	$NaIO_3.H_2O$; $Ca(IO_3)_2.6H_2O$	18
$NaIO_3 + Al(IO_3)_3 + H_2O$	298	$NaIO_3.H_2O$; $Al(IO_3)_2.6H_2O$	16
$NaIO_3 + Hf(IO_3)_4 + H_2O$	298	$NaIO_3.H_2O$; $Hf(IO_3)_4$	19

System With Sodium Halides

Aqueous ternary systems containing sodium iodate with a sodium halide have been studied in 3 publications (3, 9, 11) (see Table 6). For $NaIO_3$ - NaBr - H_2O and $NaIO_3$ - NaCl - H_2O, double salts were found, but in the $NaIO_3$ - NaI - H_2O system the formation of double salts was not reported. The compositions of the double salts are given in Table 6.

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan
(2) Water; H_2O; [7732-18-5]	June, 1984

CRITICAL EVALUATION:

Table 6. Summary of solubility studies with sodium halides

Ternary System	T/K	Solid Phase	Reference
$NaIO_3$ + NaCl + H_2O	273, 288	$NaIO_3.5H_2O$; NaCl; $2NaIO_3.3NaCl.10H_2O$	3
$NaIO_3$ + NaCl + H_2O	298, 303	$NaIO_3.H_2O$; NaCl	3
$NaIO_3$ + NaBr + H_2O	278	$NaIO_3.5H_2O$; $NaBr.2H_2O$; $2NaIO_3.3NaBr.15H_2O$	11
$NaIO_3$ + NaBr + H_2O	288	$NaIO_3.5H_2O$; $NaIO_3$; $NaBr.2H_2O$; $2NaIO_3.3NaBr.15H_2O$	11
$NaIO_3$ + NaBr + H_2O	298	$NaIO_3.H_2O$; $NaBr.2H_2O$ $2NaIO_3.3NaBr.15H_2O$	11
$NaIO_3$ + NaBr + H_2O	308	$NaIO_3.H_2O$; $NaIO_3$; $NaBr.2H_2O$; $2NaIO_3.3NaBr.15H_2O$	11
$NaIO_3$ + NaBr + H_2O	313	$NaIO_3.H_2O$; $NaIO_3$; $NaBr.2H_2O$; $2NaIO_3.2NaBr.15H_2O$; $2NaIO_3.3NaBr.10H_2O$	11
$NaIO_3$ + NaBr + H_2O	318	$NaIO_3.H_2O$; $NaIO_3$; $NaBr.2H_2O$; $2NaIO_3.3NaBr.10H_2O$	11
$NaIO_3$ + NaBr + H_2O	323	$NaIO_3.H_2O$; $NaIO_3$; $NaBr.2H_2O$; NaBr; $2NaIO_3.3NaBr.10H_2O$	11
$NaIO_3$ + NaI + H_2O	281	$NaIO_3.5H_2O$; $NaI.2H_2O$; Solid Solution	9
$NaIO_3$ + NaI + H_2O	298	$NaIO_3.H_2O$; $NaI.2H_2O$; Solid Solution	9
$NaIO_3$ + NaI + H_2O	313	$NaIO_3.H_2O$; $NaIO_3$; $NaI.2H_2O$	9

The System With Sodium Nitrate

Solubilities in this ternary system have been reported in 3 publications (4, 6, 8) (see Table 7). Foote and Vance (4) and Hill and Donovan's (6) studies covered a wide range of compositions for each temperature investigated. Below 281 K, the double salt $2NaIO_3.3NaNO_3.15H_2O$ was reported in (4, 6, 8), and sodium iodate in the solid phase is the pentahydrate. Hill and Donovan stated that their results at 278 K confirmed those of Foote and Vance, with a somewhat better agreement between calculated and experimental results for the double salt $2NaIO_3.3NaNO_3.15H_2O$. Above 283 K, no double salts form.

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2]	H. Miyamoto Niigata University Niigata, Japan
(2) Water; H_2O; [7732-18-5]	June, 1984

CRITICAL EVALUATION:

Table 7. Summary of solubilities in the ternary $NaIO_3$-$NaNO_3$-H_2O System

T/K	Solid Phase	Reference
273	$NaIO_3.5H_2O$; $NaNO_3$; $2NaIO_3.3NaNO_3.15H_2O$	4, 8
278	$NaIO_3.5H_2O$; $NaNO_3$; $2NaIO_3.3NaNO_3.15H_2O$	6
278	$NaIO_3.5H_2O$; $NaNO_3$;H_2O; $NaNO_3$; $2NaIO_3.3NaNO_3.15H_2O$	8
281	$NaIO_3.5H_2O$; $NaIO_3.H_2O$; $NaNO_3$; $2NaIO_3.3NaNO_3.15H_2O$	4
283	$NaIO_3.H_2O$; $NaNO_3$	8
293	$NaIO_3.H_2O$; $NaNO_3$	8
298	$NaIO_3.H_2O$; $NaNO_3$	4, 6
303	$NaIO_3.H_2O$; $NaNO_3$	8
308	$NaIO_3.H_2O$; $NaNO_3$	4, 8
313	$NaIO_3.H_2O$; $NaNO_3$	8
323	$NaIO_3$; $NaNO_3$	6, 8
333	$NaIO_3$; $NaNO_3$	8
343	$NaIO_3$; $NaNO_3$	8
353	$NaIO_3$; $NaNO_3$	8
363	$NaIO_3$; $NaNO_3$	8
373	$NaIO_3$; $NaNO_3$	8

Systems With Other Sodium Salts

Solubilities in the $NaIO_3$-Na_2SO_4-H_2O system at 273, 303, 308 and 323 K have been reported by Foote and Vance (5). Double salts were found only at 303, 308 and 323 K. The compositions of double salts are given in Table 8. Ternary systems $NaIO_3$-Na_2CO_3-H_2O, $NaIO_3$-$NaClO_3$-H_2O and $NaIO_3$-Na_2MoO_4-H_2O have been reported by Foote and Vance (10), Ricci (5) and Shklovskaya's group (13), respectively, and double salts were not found (see Table 8).

Table 8. Summary of the solubility of $NaIO_3$ in the presence of several sodium salts

Ternary System	T/K	Solid Phase	Ref
$NaIO_3 + Na_2SO_4 + H_2O$	273	$NaIO_3.H_2O$; $Na_2SO_4.10H_2O$	5
$NaIO_3 + Na_2SO_4 + H_2O$	302.7	$NaIO_3.H_2O$; $Na_2SO_4.10H_2O$ $NaIO_3.3Na_2SO_4$	5
$NaIO_3 + Na_2SO_4 + H_2O$	308,323	$NaIO_3.H_2O$; $Na_2SO_4.10H_2O$ $NaIO_3.4Na_2SO_4$; $NaIO_3.3Na_2SO_4$	5
$NaIO_3 + Na_2CO_3 + H_2O$	273	$NaIO_3.5H_2O$; $Na_2CO_3.10H_2O$	10

continued.....

COMPONENTS:	EVALUATOR:
(1) Sodium iodate; $NaIO_3$; [7681-55-2] (2) Water; H_2O; [7732-18-5]	H. Miyamoto Department of Chemistry Niigata University Niigata, Japan June, 1984

CRITICAL EVALUATION:

Table 8. (continued)

Ternary System	T/K	Solid Phase	Ref
$NaIO_3 + Na_2CO_3 + H_2O$	298	$NaIO_3.H_2O$; $Na_2CO_3.10H_2O$	10
$NaIO_3 + Na_2CO_3 + H_2O$	313,323	$NaIO_3.H_2O$; $Na_2CO_3.H_2O$	10
$NaIO_3 + NaClO_3 + H_2O$	298	$NaIO_3.H_2O$; $NaClO_3$	12
$NaIO_3 + NaClO_3 + H_2O$	323	$NaIO_3.H_2O$; $NaIO_3$; $NaClO_3$	12
$NaIO_3 + Na_2MoO_4 + H_2O$	298	$NaIO_3.H_2O$; $Na_2MoO_4.2H_2O$	13

REFERENCES:

1. Meerburg, P. A. *Z. Anorg. Allg. Chem.* 1905, *45*, 324.
2. Foote, H. W.; Vance, J. E. *Am. J. Sci.* 1928, [5] *16*, 68.
3. Foote, H. W.; Vance, J. E. *Am. J. Sci.* 1929, [5] *17*, 425.
4. Foote, H. W.; Vance, J. E. *Am. J. Sci.* 1929, [5] *18*, 375.
5. Foote, H. W.; Vance, J. E. *Am. J. Sci.* 1930, [5] *19*, 203.
6. Hill, A. E.; Donovan, J. E. *J. Am. Chem. Soc.* 1931, *53*, 934.
7. Hill, A. E.; Ricci, J. E. *J. Am. Chem. Soc.* 1931, *53*, 4305.
8. Cornec, M. E.; Spack, A. *Bull. Soc. Chim. Fr.* 1931, *49*, 582.
9. Hill, A. E.; Willson, H. S.; Bishop, J. A. *J. Am. Chem. Soc.* 1933, *55*, 520.
10. Foote, H. W.; Vance, J. E. *Am. J. Sci.* 1933, *25*, 499.
11. Ricci, J. E. *J. Am. Chem. Soc.* 1934, *56*, 290.
12. Ricci, J. E. *J. Am. Chem. Soc.* 1938, *60*, 2040.
13. Ricci, J. E.; Linke, W. F. *J. Am. Chem. Soc.* 1947, *69*, 1080.
14. Shibuya, M.; Watanabe, T. *Denki Kagaku* 1967, *35*, 550.
15. Shklovskaya, R. M.; Arkhipov. S. M.; Kidyarov, B. I.; Mitnitskii, P. L. *Zh. Neorg. Khim.* 1974, *19*, 1975; *Russ. J. Inorg. Chem. (Engl. Transl.)* 1974, *19*, 1082.
16. Shkovskaya, R. M.; Arkhopov, S. M.; Kidyarov, B. I.; Tokareva, A. G. *Zh. Neorg. Khim.* 1980, *25*, 1423; *Russ. J. Inorg. Chem. (Engl. Transl.)* 1980, *25*, 791.

COMPONENTS:	EVALUATOR:
(1) Sodium Iodate; $NaIO_3$; [7681-55-2] (2) Water; H_2O; [7732-18-5]	H. Miyamoto Department of Chemistry Niigata University Niigata, Japan June, 1984

CRITICAL EVALUATION:

REFERENCES: (Continued)

17. Vinogradov, E. E.; Karataeva, I. M. *Zh. Neorg. Khim.* 1982, *27*, 2155; *Russ. J. Inorg. Chem. (Engl. Transl.)* 1982, *27*, 1218.

18. Hill, A. E.; Brown, S. F. *J. Am. Chem. Soc.* 1931, *53*, 4316.

19. Shklovskaya, R. M.; Arkhipov, S. M.; Kidyarov, B. I.; Poleva, G. V.; Timofeev, S. I. *Zh. Neorg. Khim.* 1983, *28*, 2435; *Russ. J. Inorg. Chem. (Engl. Transl.)* 1984 *28*, 1384.

20. Miyamoto, H.; Salomon, M.; Clever, H. L. *Alkaline Earth Metal Halates: Vol 14, IUPAC Solubility Data Series.* Pergamon Press, London, 1983.