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Robert Maxwell  
Publisher at Pergamon Press

## Scandium nitrate

COMPONENTS:		ORIGINAL MEASUREMENTS:																																															
(1) Scandium nitrate; $\text{Sc}(\text{NO}_3)_3$ ; [13465-60-6]		Pushkina, G. Ya.; Komissarova, L.N. Zh. Neorg. Khim. 1963, 8, 1498-504; Russ. J. Inorg. Chem. Engl. Transl. 1963, 8, 777-81																																															
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]																																																	
VARIABLES:		PREPARED BY:																																															
Temperature: range $0^\circ\text{C}$ to $50^\circ\text{C}$		T. Mioduski, S. Siekierski, M. Salomon																																															
EXPERIMENTAL VALUES:																																																	
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><math>\text{Sc}_2\text{O}_3^{\text{a}}</math></th> <th style="text-align: center;"><math>\text{Sc}(\text{NO}_3)_3^{\text{b}}</math></th> <th style="text-align: center;"></th> <th style="text-align: center;"></th> <th style="text-align: center;"></th> </tr> <tr> <th style="text-align: center;"><math>t/\text{ }^\circ\text{C}</math></th> <th style="text-align: center;">mass %</th> <th style="text-align: center;">mass %</th> <th style="text-align: center;"><math>\text{mol kg}^{-1}</math></th> <th style="text-align: center;">solid phase</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">16.83</td> <td style="text-align: center;">56.37</td> <td style="text-align: center;">5.595</td> <td style="text-align: center;"><math>\text{Sc}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}</math></td> </tr> <tr> <td style="text-align: center;">15</td> <td style="text-align: center;">18.30</td> <td style="text-align: center;">61.30</td> <td style="text-align: center;">6.857</td> <td style="text-align: center;">"</td> </tr> <tr> <td style="text-align: center;">25</td> <td style="text-align: center;">18.62</td> <td style="text-align: center;">62.37</td> <td style="text-align: center;">7.176</td> <td style="text-align: center;">"</td> </tr> <tr> <td style="text-align: center;">30</td> <td style="text-align: center;">19.19</td> <td style="text-align: center;">64.28</td> <td style="text-align: center;">7.791</td> <td style="text-align: center;">"</td> </tr> <tr> <td style="text-align: center;">40</td> <td style="text-align: center;">20.00</td> <td style="text-align: center;">66.99</td> <td style="text-align: center;">8.787</td> <td style="text-align: center;">"</td> </tr> <tr> <td style="text-align: center;">50</td> <td style="text-align: center;">20.19</td> <td style="text-align: center;">67.63</td> <td style="text-align: center;">9.045</td> <td style="text-align: center;">"</td> </tr> <tr> <td style="text-align: center;"><math>60^{\text{c}}</math></td> <td style="text-align: center;"><math>\infty</math></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					$\text{Sc}_2\text{O}_3^{\text{a}}$	$\text{Sc}(\text{NO}_3)_3^{\text{b}}$				$t/\text{ }^\circ\text{C}$	mass %	mass %	$\text{mol kg}^{-1}$	solid phase	0	16.83	56.37	5.595	$\text{Sc}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$	15	18.30	61.30	6.857	"	25	18.62	62.37	7.176	"	30	19.19	64.28	7.791	"	40	20.00	66.99	8.787	"	50	20.19	67.63	9.045	"	$60^{\text{c}}$	$\infty$			
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<p>a. Original experimental data are mass % <math>\text{Sc}_2\text{O}_3</math>. The authors also reported calculated values for the solubilities of <math>\text{Sc}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}</math>. These values are not given in this compilation because they are too low by about 0.1% due to the authors' use of old values of atomic weights, and because the solubilities in terms of the <i>anhydrous</i> salt are the more relevant quantities.</p> <p>b. Calculated by the compilers.</p> <p>c. Authors state that since the melting point of the tetrahydrate is <math>50^\circ\text{C}</math> (1), the salt is infinitely soluble above this temperature.</p>																																																	
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METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:																																																
Isothermal method used. The initial materials were placed in glass vessels and thermostated. For high $\text{HNO}_3$ concentrations, the vessels were sealed with liquid paraffin. Equilibrium was reached within 2-3 days as ascertained by successive analyses. 1-2 g of saturated solution was removed for each analyses with a pipet fitted with a detachable No. 2 or No. 3 Schott filter. 0.5-1 g of solid was also removed for analysis.	$\text{Sc}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$ was crystallized from nitric acid solution containing at least 44.26 mass % $\text{N}_2\text{O}_5$ . Chemical analysis resulted in the following (mean of 3 detns): Sc 14.84 mass %, $\text{NO}_3^-$ 61.33 mass %. Impurities in the salt stated not to exceed 0.01 %. A.R. grade conc $\text{HNO}_3$ used (sp. gr. 1.35) or 100 % $\text{HNO}_3$ used obtained by distn from a mixt of nitric and sulfuric acids.																																																
Scandium was determined gravimetrically by precipitation as the hydroxide and ignition to the oxide. Nitrogen was determined by Devarda's method, and water was calculated from the loss in weight upon heating to $900^\circ\text{C}$ . The results given in the above table are means of three determinations.	ESTIMATED ERROR:																																																
	Solv: reproducibility $\pm 1\%$ or better (compilers). Temp: accuracy $\pm 0.1\text{ K}$ (authors).																																																
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	1. Komissarova, L.N.; Pushkina, G. Ya.; Spitsyn, V.I. Zh. Neorg. Khim. 1963, 8, 1384; Russ. J. Inorg. Chem. Engl. Transl. 1963, 8, 719.																																																

## Yttrium nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Yttrium nitrate; $\text{Y}(\text{NO}_3)_3$ ; [10361-93-0]	Crew, M.C.; Steinert, H.E.; Hopkins, B.S.
(2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	<i>J. Phys. Chem.</i> <u>1925</u> , 29, 34-8.
VARIABLES:	PREPARED BY:
Temperature	T. Mioduski, S. Siekierski, M. Salomon

## EXPERIMENTAL VALUES:

t/°C	mass satd sln/g	mass $\text{Y}_2\text{O}_3/\text{g}$	solubility of $\text{Y}(\text{NO}_3)_3$		
			g(1)/100	g(2) <sup>a</sup>	g(1)/100 g(2) <sup>b</sup>
0	1.3078	0.2596	93.1	93.55	3.403
22.5	1.2234	0.2888	136	135.2	4.917
22.5	1.2721	0.2988	133	133.6	4.860
35	0.7403	0.1853	155	156.1	5.677
60.2	0.5738	0.1561	197	196.2	7.138
60.2	0.7974	0.2193	203.1	202.7	7.374
66.5	0.9248	0.2585	211	213.1	7.752

a. Authors' original calculations based on 1925 atomic masses.

b. Compilers' calculations based on atomic masses recommended in the 1977 biennial report of the IUPAC Commission on Atomic Weights.

c. Molalities calculated by the compilers based on 1977 IUPAC recommended atomic masses.

The molalities were fitted to the following smoothing equation:

$$\text{soly/mol kg}^{-1} = -15.126 + 0.070700(\text{T/K}) - 1.0360 \times 10^{-5}(\text{T/K})^2$$

The standard deviation for this fit is  $\sigma = 0.078 \text{ mol kg}^{-1}$ , and the correlation coefficient is 0.998. Using this smoothing equation, the solubility of  $\text{Y}(\text{NO}_3)_3$  in water at 25°C is calculated to be 5.035 mol kg<sup>-1</sup>.

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Flasks of the solid and liquid were placed in a thermostat and equilibrated for at least 5 hours with periodic shaking. Equilibrium was approached from above. Samples of saturated solutions were removed from the flasks through a filter, and the funnel used in this procedure was "brought as close as possible" to the temperature of the saturated solutions. The saturated solutions were transferred to a weighing bottle and weighed. The saturated solutions were then evaporated to dryness and ignited to the oxide in a Pt dish.	Yttrium "material slightly short of atomic weight purity" contained traces of Ho and Er. It was twice pptd as the hydroxide and then twice as the oxalate. The oxalate was ignited to $\text{Y}_2\text{O}_3$ and dissolved in $\text{HNO}_3$ , and the slm evaporated to crystallization. The crystals were washed (presumably with water) and centrifuged to remove excess liquid. Freshly distilled water "protected from the air" was used. $\text{HNO}_3$ was freshly redistilled from a quartz apparatus. Oxalic acid was recrystallized several times.
The nature of the solid phase was not specified.	
ESTIMATED ERROR:	
Soly: Authors state mean error is $\pm 1.5\%$ , but in some cases it is $\pm 3\%$ (compilers).	
Temp: precision no better than $\pm 0.2 \text{ K}$ (compilers).	

COMPONENTS: (1) Yttrium nitrate; $\text{Y}(\text{NO}_3)_3$ ; [10361-93-0] (2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	ORIGINAL MEASUREMENTS: Moret, R. <i>Thèse</i> , l'Université de Lausanne. <u>1963.</u>		
VARIABLES: Temperature: range $0^\circ\text{C}$ to $50^\circ\text{C}$	PREPARED BY: T. Mioduski and S. Siekierski		
EXPERIMENTAL VALUES:	Solubility <sup>a</sup>		
	moles of $\text{H}_2\text{O}$ per 100 moles salt		
t/ $^\circ\text{C}$	mass %	mol $\text{kg}^{-1}$	solid phase
0	55.51	1223	$\text{Y}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$
10	57.12		"
20	58.45	1085	"
25	59.92		"
30	61.23		"
35	62.49		"
40	63.76	6.400	$\text{Y}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$
50	64.51	6.612	"
a. Molalities calculated by compilers from mass % values.			
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The isothermal method was used as described in (1). Y was determined by complexometric titration using Xylenol Orange indicator in the presence of a small amount of urotropine buffer. Water was determined by difference.	Yttrium nitrate was prepared from $\text{Y}_2\text{O}_3$ of purity better than 99.7% (obtained by the ion exchange chromatographic method).		
COMMENTS AND/OR ADDITIONAL DATA:	ESTIMATED ERROR: Solv: precision about $\pm 0.1\%$ (compilers). Temp: precision at least $\pm 0.05\text{ K}$ (compilers).		
The author states that the temperature for the hexahydrate to pentahydrate transition is $38.5^\circ\text{C}$ . This temperature was determined graphically.	REFERENCES:		
	1. Brunisholz, G.; Quinche. J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> . 47, 14.		

## Lanthanum nitrate

COMPONENTS:		ORIGINAL MEASUREMENTS:	
(1) Lanthanum nitrate; $\text{La}(\text{NO}_3)_3$ ; [10099-59-9]		Friend, J.N. <i>J. Chem. Soc.</i> <u>1935</u> , 824-6.	
(2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]			
VARIABLES:		PREPARED BY:	
Temperature		T. Mioduski, S. Siekierski, M. Salomon	
EXPERIMENTAL VALUES:			
Solubility of $\text{La}(\text{NO}_3)_3$ in water as a function of temperature: <sup>a</sup>			
t/°C	mass %	mol kg <sup>-1</sup>	solid phase
0	50.03	3.081	$\alpha\text{-La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$
18.4	54.16	3.636	"
21.2	55.03	3.766	"
25.4	55.80	3.885	"
35.4	59.12	4.451	"
42.4	63.84	5.434	"
44.2	65.13	5.748	"
14.4	56.27	3.960	$\beta\text{-La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$
15.2	56.94	4.070	"
15.8	56.85	4.055	"
16.0	56.74	4.037	"
23.2	58.7	4.374	"
29.6	60.08	4.632	"
32.2	61.34	4.883	"
40.0	62.71	5.176	"
46.4	64.55	5.604	"
49.4	65.17	5.759	"
56.0	68.30	6.631	"
64.5 <sup>b</sup>	75.04	9.253	"
<sup>a</sup> The transition temperature for the $\alpha \rightarrow \beta$ was reported as approximately 43°C as read from the intersection of the plots of solubility vs t/°C for the $\alpha$ and $\beta$ hexahydrates.			
<sup>b</sup> Melting point of the hexahydrate (theoretical concentration at the congruent melting point is 9.251 mol kg <sup>-1</sup> , compilers).			
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The isothermal method was used as described earlier (1). Aliquots of around 50 cc were taken from 250 cc "saturation bottles" and La precipitated as the oxalate. La was determined gravimetrically by ignition of the oxalate to the oxide. As a check of the method, 5 samples were evaporated to dryness and directly ignited to the oxide, and the results were always higher by 0.1 to 0.4 %.	Lanthanum nitrate was prepared by dissolving the oxide in dilute nitric acid and inducing crystallization by seeding with $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ . The author claims that the initial precipitate is $\beta\text{-La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ which is transformed into the more stable $\alpha$ form upon prolonged standing at room temperature. The $\alpha$ -salt is also said to form from the supersaturated solution "upon appropriate seeding." No details were given.		
COMMENTS AND/OR ADDITIONAL DATA:	ESTIMATED ERROR: Solv: Accuracy around $\pm 30\%$ (compilers).		
This paper is the only study that reports $\alpha$ and $\beta$ phases for the hexahydrate. This is discussed further in the critical evaluation.	Temp: Probably around $\pm 0.2\text{ K}$ as in (1).		
The molalities in the table were calculated by the compilers.	REFERENCES:		
	1. Friend, J.N. <i>J. Chem. Soc.</i> <u>1930</u> , 1633.		

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lanthanum nitrate; La(NO <sub>3</sub> ) <sub>3</sub> ; [10099-59-9] (2) Water ; H <sub>2</sub> O ; [7732-18-5]	Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , 47, 14-27.
VARIABLES: Temperature	PREPARED BY: T. Mioduski and S. Siekierski

## EXPERIMENTAL VALUES:

Solubility of La(NO<sub>3</sub>)<sub>3</sub> in water<sup>a</sup>

t/°C	mass %	mol kg <sup>-1</sup>
0	54.99	3.760
5	55.88	3.898
10	57.09	4.095
20	58.97	4.423
25	59.98	4.613
35	62.34	5.095
50	66.29	6.052

a. Molalities calculated by M. Salomon.

Authors report that the solid phase is La(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O

AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS: La <sub>2</sub> O <sub>3</sub> purified by the ion exchange method had a purity better than 99.7 %. The nitrate salt was presumably prepared from the oxide by addition of nitric acid followed by crystallization. No additional details were given.
The isothermal method was used. Lanthanum determined by complexometric titration using xylenol orange indicator in the presence of a small quantity of urotropine buffer. Water was determined by difference. No additional information given.	ESTIMATED ERROR: Solv: precision ± 0.2 % (compilers). Temp: precision about ± 0.05 K (compilers).
	REFERENCES:

## Lanthanum nitrate

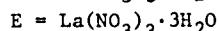
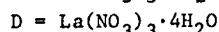
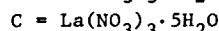
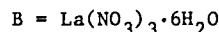
COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lanthanum nitrate; $\text{La}(\text{NO}_3)_3$ ; [10099-59-9] (2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	Mironov, K.E.; Popov, A.P. <i>Rev. Roum. Chim.</i> 1966, 11, 1373 - 81.

VARIABLES:	PREPARED BY:
Temperature	T. Mioduski and S. Siekierski

EXPERIMENTAL VALUES:							
Solubility of $\text{La}(\text{NO}_3)_3$ in water <sup>a</sup>							
t/°C	mass %	mol kg <sup>-1</sup>	solid phase <sup>b</sup>	t/°C	mass %	mol kg <sup>-1</sup>	solid phase <sup>b</sup>
-0.3	8.6	0.29	A	21.4	59.2	4.47	B
-2.6	18.5	0.699	A	27.7	61.0	4.81	B
-4.9	23.3	0.935	A	36.3	62.6	5.15	B
-9.5	35.6	1.70	A	41.3	64.0	5.47	B + C
-12.8	40.2	2.07	A	48.6	65.3	5.79	C + D + E
-18.1	45.9	2.61	A	52.7	66.5	6.11	C + D + E
-22.9	48.9	2.95	A	55.4	67.6	6.42	C + D + E
-25.9	51.3	3.24	A + B	60.9	70.2	7.25	C + D + E
-15.0	52.4	3.39	B	69.9	73.4	8.49	C + D + E
2.7	54.4	3.67	B	79.9	76.6	10.07	C + D + E
5.3	55.3	3.81	B	98.4	78.8	11.44	C + D + E
15.8	57.9	4.23	B	122.0	79.9	12.23	C + D + E

a. Molalities calculated by M. Salomon.

b. Solid phases: A = ice



## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The synthetic method was used. The temperature of crystallization was determined visually. Authors state that only stable equilibrium data are given. No additional information given.	$\text{La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ prepared by dissolving 99.9 % pure $\text{La}_2\text{O}_3$ in nitric acid followed by crystallization. Double distilled water was used.

## ESTIMATED ERROR:

Solv: precision probably  $\pm 0.2$  to  $\pm 0.5\%$  (compilers).

Temp: precision  $\pm 0.2$  K (authors).

## REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lanthanum nitrate; $\text{La}(\text{NO}_3)_3$ ; [10099-59-9]  (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	Popov, A.P.; Mironov, K.E. <i>Zh. Neorg. Khim.</i> 1971, 16, 464-6; <i>Russ. J. Inorg. Chem.</i> <i>Engl. Transl.</i> 1971, 16, 464-6.
VARIABLES:  One temperature: 25°C	PREPARED BY:  T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

The solubility of metastable  $\text{La}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$  in water at 25°C was reported to be  
62.5 mass %

The corresponding value in molality was calculated by the compilers:

$$5.13 \text{ mol kg}^{-1}$$

## COMMENTS AND/OR ADDITIONAL DATA:

It is not clearly stated whether the solubility of the pentahydrate was actually measured in the present work or whether the authors are reporting the value obtained from earlier work (1). In reference (1) the solubility of the pentahydrate at 25°C was given as 62.47 mass % (see the compilation of the data from this paper).

By extrapolation of the solubility branch for  $\text{La}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$  from data in the ternary system  $\text{La}(\text{NO}_3)_3 - \text{HNO}_3 - \text{H}_2\text{O}$ , the authors calculated the solubility of the metastable tetrahydrate in pure water as 70.5 mass % ( $7.35 \text{ mol kg}^{-1}$ ). See the critical evaluation for additional details.

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:  Experimental method not specified.  Metastable (at 25°C) $\text{La}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ was probably obtained by slow cooling of a saturated $\text{La}(\text{NO}_3)_3$ solution from 40-50°C to 25°C (1).	SOURCE AND PURITY OF MATERIALS:  No details given.
	ESTIMATED ERROR:  Solv: Not specified, but precision probably $\pm 0.5$ mass % units (compilers).  Temp: precision around $\pm 0.2$ K (compilers).
	REFERENCES:  1. Mironov, K.E.: Popov, A.P.; Khripin, L.A. <i>Zh. Neorg. Khim.</i> 1966, 11, 2789; <i>Russ. J. Inorg. Chem. Engl. Transl.</i> 1966, 11, 1499.

## Lanthanum nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lanthanum nitrate; La(NO <sub>3</sub> ) <sub>3</sub> ; [10099-59-9] (2) Water; H <sub>2</sub> O; [7732-18-5]	<p>1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 88-93.</p> <p>2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u>, 257-62.</p> <p>3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u>, <u>21</u>, 474-88.</p>
VARIABLES:	PREPARED BY:
One temperature: 25°C	T. Mioduski, S. Siekierski, and M. Salomon
EXPERIMENTAL VALUES:	
<p>The solubility of La(NO<sub>3</sub>)<sub>3</sub> in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 4.608 mol kg<sup>-1</sup>, but the preferred value is given in source papers [1] and [2] as 4.610 mol kg<sup>-1</sup>.</p>	
<u>COMMENTS AND/OR ADDITIONAL DATA:</u>	
<p>Source paper [1] reports the relative viscosity, <math>\eta_R</math>, of a saturated solution to be 20.078. Taking the viscosity of water to be 0.008903 P at 25°C, the viscosity of a saturated La(NO<sub>3</sub>)<sub>3</sub> solution at 25°C is 0.17875 P.</p> <p>Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u> have enabled the compilers to provide the following additional data on the La(NO<sub>3</sub>)<sub>3</sub> - H<sub>2</sub>O system.</p> <p>The density of the saturated solution was calculated by the compilers from the smoothing equation in source paper [2], and the value at 25°C is 1.8097 kg m<sup>-3</sup>. Using this density, the solubility of La(NO<sub>3</sub>)<sub>3</sub> in volume units (based on <math>m_{\text{satd}} = 4.6100 \text{ mol kg}^{-1}</math>) is</p>	
$c_{\text{satd}} = 3.340 \text{ mol dm}^{-3}$	
<p>Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent) <math>\kappa = 0.020369 \text{ S cm}^{-1}</math>. The molar conductivity of the saturated solution as calculated from <math>1000\kappa/3c_{\text{satd}}</math> is</p>	
$\Lambda(\frac{1}{3}\text{La}(\text{NO}_3)_3) = 2.033 \text{ S cm}^2 \text{ mol}^{-1}$	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS: La(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O was prepared by addition of HNO <sub>3</sub> to the oxide. The oxide was purified by an ion exchange method and rare earth impurities were less than 0.1%. Ca and Fe impurities were also less than 0.1%. In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate. Water was distilled from alkaline permanganate.
<p>Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to <math>\pm 0.1\%</math> or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before H<sub>2</sub>SO<sub>4</sub> additions were made. This eliminated the possibility of nitrate ion coprecipitation.</p>	
<p>ESTIMATED ERROR: Solv: Duplicate analyses agreed to at least <math>\pm 0.1\%</math>. Temp: Not specified, but probably accurate to at least <math>\pm 0.01\text{ K}</math> as in (3).</p>	
REFERENCES:	
<p>1. Spedding, F.H.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u>, <u>78</u>, 1106. 2. Spedding, F.H.; Pikal, M.J. Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u>, <u>70</u>, 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 72.</p>	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cerium nitrate; Ce(NO <sub>3</sub> ) <sub>3</sub> ; [10108-73-3] (2) Water; H <sub>2</sub> O; [7732-18-5]	Quill, L.L.; Robey, R.F. <i>J. Am. Chem. Soc.</i> 1937, 59, 2591-5
VARIABLES:	PREPARED BY:
Two temperatures	T. Mioduski, S. Siekierski, M. Salomon
EXPERIMENTAL VALUES:	
<u>At 25°C</u> , soly = 63.71 mass %, density = 1.88 kg m <sup>-3</sup> <u>At 50°C</u> , soly = 73.88 mass %, density = 2.04 kg m <sup>-3</sup>	
<u>Compilers' Conversions</u>	
25°C, soly = 5.383 mol kg <sup>-1</sup> or 3.67 mol dm <sup>-3</sup> 50°C, soly = 8.673 mol kg <sup>-1</sup> or 4.62 mol dm <sup>-3</sup>	
The solid phase at both temperatures is the hexahydrate.	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE: Isothermal method. The salt and water were placed in pyrex tubes, heated to induce supersaturation, and thermostated. The pyrex tubes were sealed after a small crystal of Bi(NO <sub>3</sub> ) <sub>3</sub> ·5H <sub>2</sub> O was added to "seed" crystallization. The sealed tubes were shaken in the thermostat for at least 8 hours (equilibrium was reached in 4 hours). Authors state that approach to equilibrium from undersaturation gave identical results within experimental error. All data reported above are the results obtained by approach from supersaturation. A "filtering pipet" maintained at a temp slightly higher than the thermostat temp was used to withdraw samples for analyses. Weighed samples of liquid and solid phases were analysed. Ce was pptd as the oxalate, filtered, washed with hot dilute oxalic acid, and ignited to the oxide (CeO <sub>2</sub> ). Ce(IV) detd in the presence of Ce(III) by adding excess standard Fe(II) sln to the sample in H <sub>2</sub> SO <sub>4</sub> sln, and titrating the excess Fe(II) with standard ceric ammonium sulfate. The solid phase analysed as the hexahydrate (calcd anhydr salt 75.10%, found 75.10, 75.00%).	SOURCE AND PURITY OF MATERIALS: HNO <sub>3</sub> prep'd from c.p. grade by distillation in an all pyrex still and retaining the middle fraction. For very high HNO <sub>3</sub> concs, reagent grade fuming HNO <sub>3</sub> used as received. "Pure" cerium nitrate (G.F. Smith) was pptd three times (the basic bromate method). The ceric basic bromate was washed, mixed with HNO <sub>3</sub> , and dissolved by addn of 3% H <sub>2</sub> O <sub>2</sub> sln. Cerium was then pptd as the oxalate, washed and digested in HNO <sub>3</sub> on a steam bath. The sln was evap to crystallization and the salt dried over 5% sulfuric acid in a desiccator. Distilled water was used which had an electrolytic conductivity of 2 x 10 <sup>-6</sup> S cm <sup>-1</sup> .
ESTIMATED ERROR: Soly: precision about ± 0.5 % (compilers). Temp: at 25°C, accuracy was ± 0.03 K. at 50°C, accuracy was ± 0.1 K.	

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Cerium (III) nitrate; Ce(NO <sub>3</sub> ) <sub>3</sub> ; [10108-73-3] (2) Water; H <sub>2</sub> O; [7732-18-5]		Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , 47, 14-27.		
VARIABLES:		PREPARED BY:		
Temperature		T. Mioduski and S. Siekierski		
EXPERIMENTAL VALUES:				
Solubility of Ce(NO <sub>3</sub> ) <sub>3</sub> in water <sup>a</sup>				
t/°C	mass %	mol kg <sup>-1</sup>		
0	58.02	4.238		
10	59.83	4.567		
20	62.02	5.007		
35	65.62	5.852		
50	70.51	7.331		
a. Molalities calculated by compilers.				
Authors report the solid phase to be Ce(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The isothermal method was used. Cerium determined by complexometric titration using xylenol orange indicator in the presence of a small quantity of urotropine buffer (10 mg of ascorbic acid was added to avoid oxidation of Ce(III)). Water was determined by difference.	Cerium nitrate was prepared from the oxide of purity better than 99.7% (obtained by the ion exchange chromatography).			
ESTIMATED ERROR:				
Solv: precision ± 0.1% (compilers). Temp: precision probably ± 0.05K (compilers).				
REFERENCES:				



COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cerium nitrate; Ce(NO <sub>3</sub> ) <sub>3</sub> ; [10108-73-3] (2) Water; H <sub>2</sub> O; [7732-18-5]	Popov, A.P.; Mironov, K.E. <i>Zh. Neorg. Khim.</i> 1971, 16, 464-6; <i>Russ. J. Inorg. Chem. Engl. Transl.</i> 1971, 16, 244-6.
VARIABLES:	PREPARED BY:
One temperature: 25°C	T. Mioduski, S. Siekierski, M. Salomon
EXPERIMENTAL VALUES:	
<p>The solubility of <u>metastable</u> Ce(NO<sub>3</sub>)<sub>3</sub>·5H<sub>2</sub>O in water at 25°C was reported as: 66.6 mass %</p> <p>The corresponding molality value was calculated by the compilers as: 6.11 mol kg<sup>-1</sup></p>	
COMMENTS AND/OR ADDITIONAL DATA:	
<p>It is not clearly stated whether the solubility of the pentahydrate was actually measured in the present work or whether the authors are reporting the value obtained from earlier work (1). In reference (1) the solubility of the pentahydrate at 25°C was given as 66.6 mass % (see the compilation of the data from this paper).</p> <p>By extrapolation of the solubility branch for Ce(NO<sub>3</sub>)<sub>3</sub>·4H<sub>2</sub>O from data in the ternary system Ce(NO<sub>3</sub>)<sub>3</sub>-HNO<sub>3</sub>-H<sub>2</sub>O, the authors calculated the solubility of the metastable tetrahydrate in pure water as 71.0 mass % (7.51 mol kg<sup>-1</sup>). See the critical evaluation for additional details.</p>	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Experimental method not specified. Metastable (at 25°C) Ce(NO <sub>3</sub> ) <sub>3</sub> ·5H <sub>2</sub> O could have been obtained by slow cooling of a saturated Ce(NO <sub>3</sub> ) <sub>3</sub> solution from 40°-50°C to 25°C (1).	Nothing specified.
ESTIMATED ERROR:	
<p>Solv: Not specified, but precision probably ± 0.5 mass % units (compilers).</p> <p>Temp: Nothing Specified.</p>	
REFERENCES:	
<p>1. Popov, A.P.; Mironov, K.E. <i>Izv. Sib. Otd. Adad. Nauk. SSSR, Ser. Khim. Nauk.</i> 1967, 12, 109-11.</p>	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Praseodymium nitrate; $\text{Pr}(\text{NO}_3)_3$ ; [10361-80-5] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	Friend, J.N. <i>J. Chem. Soc.</i> <u>1935</u> , 1430-2.

VARIABLES:	PREPARED BY:
Temperature	T. Mioduski and S. Siekierski

EXPERIMENTAL VALUES:			

Solubility of  $\text{Pr}(\text{NO}_3)_3$ <sup>a</sup>

t/°C	mass %	mol kg <sup>-1</sup>	solid phase
15.8	59.32	4.460	$\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$
22.0	60.18	4.623	"
30.4	61.94	4.978	"
43.0	65.00	5.681	"
56.0 <sup>b</sup>	75.15	9.250	"

a. Molalities calculated by the compilers.

b. Melting point.

AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:

The isothermal method was used as described in (1). Aliquots of saturated solutions were diluted to 250 c.c. and Pr precipitated as the oxalate. The oxalate was ignited to $\text{Pr}_6\text{O}_{11}$ in a Pt dish and weighed. The author reports the solubility in mass % of the anhydrous salt, and the original data of mass % of oxide was not given.	Praseodymium nitrate was prepared by dissolving $\text{Pr}_6\text{O}_{11}$ in dilute $\text{HNO}_3$ , and seeding the concentrated solutions with $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ . The crystals melted at approximately 56°C. (Compilers note: this is the approximate temperature of the congruent melting point).
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ESTIMATED ERROR: Solv: precision $\pm$ 1 % at best (compilers). Temp: accuracy probably $\pm$ 0.5 to 0.1 K as in (1) (compilers).
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REFERENCES:
1. Friend, J.N. <i>J. Chem. Soc.</i> <u>1930</u> , 1633.

COMPONENTS:		ORIGINAL MEASUREMENTS:				
(1) Praseodymium nitrate; $\text{Pr}(\text{NO}_3)_3$ ; [10361-80-5]		Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , 47, 14-27.				
(2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]						
VARIABLES:		PREPARED BY:				
Temperature		T. Mioduski and S. Siekierski				
EXPERIMENTAL VALUES:						
Solubility of $\text{Pr}(\text{NO}_3)_3$ <sup>a</sup>						
t/°C	mass %	$\text{mol kg}^{-1}$	solid phase			
0	57.46	4.132	$\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$			
10	59.29	4.455	"			
20	61.24	4.833	"			
35	64.86	5.646	"			
50	69.40	6.937	"			
a. Molalities calculated by the compilers.						
AUXILIARY INFORMATION						
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:					
The isothermal method was used. Praseodymium determined by complexometric titration using Xylenol Orange indicator and a small quantity of urotropine buffer.	Praseodymium nitrate was prepared from the oxide of purity better than 99.7 % (purified by ion exchange).					
ESTIMATED ERROR:						
Solv: precision $\pm 0.2\%$ (compilers).						
Temp: precision probably better than $\pm 0.1\text{ K}$ (compilers).						
REFERENCES:						



COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Praseodymium nitrate; $\text{Pr}(\text{NO}_3)_3$ ; [10361-80-5] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]		Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> 1975, 79, 257-62.		
VARIABLES:		PREPARED BY:		
One temperature: 25.0°C		T. Mioduski, S. Siekierski, M. Salomon		
EXPERIMENTAL VALUES:				
The solubility of $\text{Pr}(\text{NO}_3)_3$ in water at 25°C was reported to be $m_1 = 5.0166 \text{ mol kg}^{-1}$				
COMMENTS AND/OR ADDITIONAL DATA:				
Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> 1975, 79 have enabled the compilers to provide the following additional data:				
The density of the saturated solution was calculated by the compilers from the smoothing equation and found to be $1.8687 \text{ kg m}^{-3}$ at 25.00°C. Using this density, the concentration of the saturated solution in volume units is $C_1 = 3.5510 \text{ mol dm}^{-3}$				
The electrolytic conductivity of the saturated solution corrected for the electrolytic conductivity of water was given as $0.015705 \text{ S cm}^{-1}$ . The molar conductivity of the saturated solution is $\Lambda(\frac{1}{3} \text{Pr}(\text{NO}_3)_3) = 1.474 \text{ S cm}^2 \text{ mol}^{-1}$				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The isothermal method was used. Experimental details on how equilibrium was ascertained not provided. Satd soln was analysed by both EDTA and sulfate methods, and resulting concn is reliable to $\pm 0.1\%$ or better. When sulfate analyses were performed, the $\text{Pr}(\text{NO}_3)_3$ samples were decomposed with HCl followed by evapn to dryness before the $\text{H}_2\text{SO}_4$ additions were made. This treatment eliminated the possibility of nitrate ion copptn. The solid phase is $\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ .	1. The oxide was furnished by the Ames Laboratory Rare Earth Separation Group. No other details provided, but presumably the oxide was 99.85 % pure or better as used in other papers by the authors. 2. Presumably conductivity water was used.			
ESTIMATED ERROR: Solv: the reported result is reliable to $\pm 0.1\%$ or better. Temp: the oil bath temp. was controlled to $24.99 \pm 0.01^\circ\text{C}$ .				
REFERENCES:				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Praseodymium nitrate; $\text{Pr}(\text{NO}_3)_3$ ; [10361-80-5] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <i>21</i> , 474-88.
VARIABLES:	PREPARED BY:
One temperature: $25.00^\circ\text{C}$	T. Mioduski and S. Siekierski

## EXPERIMENTAL VALUES:

The solubility of  $\text{Pr}(\text{NO}_3)_3$  in water at  $25^\circ\text{C}$  was reported to be

$$m_1 = 4.990 \text{ mol kg}^{-1}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The isothermal method was used. The satd solns (no details on how equilibrium was ascertained) were analysed by EDTA and gravimetric sulfate methods, and resulting concn is reliable to $\pm 0.1\%$ or better in terms of molality. The nitrate samples were decomposed by heating with HCl before the sulfate pptns were performed to avoid nitrate ion copptn. The solid phase is $\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ (Hydrated crystals were grown from satd soln at $25^\circ\text{C}$ and hydrate compns were detd by EDTA analyses. After drying, the hydrates were found to be within $\pm 0.16$ water molecules of the indicated hydrate).	<p>1. The stoichiometric nitrate was obtained from the ion exchange purified oxide and <math>\text{HNO}_3</math> (1). The purity of the oxide was 99.85 mass % or better with adjacent lanthanides, Ca, Fe, Si being the principal impurities.</p> <p>2. Conductivity water: electrolytic conductivity less than <math>1 \times 10^{-6} \text{ S cm}^{-1}</math>.</p>
ESTIMATED ERROR:	
<p>Solv: The reported value is reliable to <math>\pm 0.1\%</math> or better in terms of molality.</p> <p>Temp: precision probably <math>\pm 0.02 \text{ K}</math> (compilers).</p>	
REFERENCES:	
<p>1. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u>, <i>70</i>, 2440.</p>	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neodymium nitrate; Nd(NO <sub>3</sub> ) <sub>3</sub> ; [10045-95-1]  (2) Water ; H <sub>2</sub> O ; [7732-18-5]	Friend, J.N. <i>J. Chem. Soc.</i> <u>1935</u> , 1430-2.
VARIABLES:	PREPARED BY:
Temperature: range 0° to 67.5° C	T. Mioduski, S. Siekierski and M. Salomon

## EXPERIMENTAL VALUES:

Composition of saturated solutions<sup>a</sup>

t/°C	mass %	mol kg <sup>-1</sup>	nature of the solid phase <sup>b</sup>
0.0 <sup>c</sup>	55.97	3.711	α-Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O
13.2	57.37	4.075	"
18.2 <sup>c</sup>	58.03	4.187	"
23.0 <sup>c</sup>	59.59	4.465	"
26.2 <sup>c</sup>	60.69	4.675	"
27.2	58.17	4.211	β-Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O
29.4	59.18	4.390	"
37.2	60.95	4.726	"
42.4	61.91	4.922	"
50.0	64.86	5.589	"
57.2 <sup>c</sup>	67.00	6.148	"
66.2 <sup>d</sup>	73.13	8.241	"
67.5 <sup>d</sup>	75.34	9.251	"

a. Molalities calculated by the compilers.

b. Transition temperature for the α and β phases is approx 22° C.

c. Solid phase analysed and found to be the hexahydrate.

d. Melting point solubility calcd by the compilers.

## AUXILIARY INFORMATION

METHOD APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The isothermal method used as described earlier (1). Aliquots of around 50 cc were taken from 250 cc "saturation bottles" and Nd precipitated as the oxalate. Nd was determined gravimetrically by ignition of the oxalate to the oxide. As a check on the method, several samples of the saturated solutions were evaporated to dryness and directly ignited to the oxide. These results were always higher by 1.5 to 2 %, and the solubilities were therefore calculated from the results obtained by the oxalate method.	Neodymium nitrate was prepared by dissolution of the oxide in dilute HNO <sub>3</sub> . The filtered solution was concentrated on a water-bath and was seeded on the first occasion with the lanthanum salt (presumably the salt was then recrystallized, compilers). The melting point of the hexahydrate was 67.5° C.  The source and purity of water was not specified.
COMMENTS AND/OR ADDITIONAL DATA:	ESTIMATED ERROR: Solv: precision around ± 1-2 % (compilers). Temp: accuracy probably ± 0.05 K or better as in (1) (compilers).
This paper is the only study that reports the existence of α and β phases for the hexahydrate. This is discussed further in the critical evaluation.	REFERENCES:
	1. Friend, J.N. <i>J. Chem. Soc.</i> <u>1930</u> , 1633.

COMPONENTS:		ORIGINAL MEASUREMENTS:			
(1) Neodymium nitrate; Nd(NO <sub>3</sub> ) <sub>3</sub> ; [10045-95-1] (2) Water; H <sub>2</sub> O; [7732-18-5]		Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> 1964, 47, 14-27.			
VARIABLES:		PREPARED BY:			
Temperature		T. Mioduski and S. Siekierski			
EXPERIMENTAL VALUES:					
Solubility of Nd(NO <sub>3</sub> ) <sub>3</sub> as a function of temperature <sup>a</sup>					
t/°C	mass %	mol kg <sup>-1</sup>	solid phase		
0	55.71	3.809	Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O		
10	57.62	4.117	"		
20	59.29	4.410	"		
35	62.62	5.073	"		
50	66.29	5.954	"		
a. Molalities calculated by the compilers.					
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:				
The isothermal method was used. Neodymium was determined by complexometric titration using Xylenol orange indicator in the presence of a small quantity of urotropine buffer.	Nd <sub>2</sub> O <sub>3</sub> was purified by the ion exchange method, and had a purity of better than 99.7 %. The nitrate was prepared by dissolving the oxide in nitric acid followed by crystallization: details not given.				
ESTIMATED ERROR:		Soly: precision around ± 0.2 % (compilers). Temp: precision ± 0.05 K or better (compilers).			
REFERENCES:					

<b>COMPONENTS:</b> (1) Neodymium nitrate; Nd(NO <sub>3</sub> ) <sub>3</sub> ; [10045-95-1] (2) Water ; H <sub>2</sub> O ; [7732-18-5]	<b>ORIGINAL MEASUREMENTS:</b> Popov, A.P.; Mironov, K.E. <i>Rev. Roum. Chim.</i> 1968, 13, 765-73.
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<b>VARIABLES:</b> Temperature: range -29°C to 122°C	<b>PREPARED BY:</b> T. Mioduski and S. Siekierski
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EXPERIMENTAL VALUES:							
Solubility of Nd(NO <sub>3</sub> ) <sub>3</sub> as a function of temperature <sup>a</sup>							
t/°C	mass %	mol kg <sup>-1</sup>	solid phase	t/°C	mass %	mol kg <sup>-1</sup>	solid phase
- 1.5	16.1	0.58	ice	33.7	61.3	4.80	Nd(NO <sub>3</sub> ) <sub>3</sub> ·5H <sub>2</sub> O
- 2.3	20.7	0.79	"	43.3	63.5	5.27	"
- 6.3	32.8	1.48	"	45.4	64.7	5.55	"
-12.9	38.8	1.92	"	50.8	66.2	5.93	"
-21.0	45.2	2.50	"	55.6	68.6	6.62	"
-24.6	48.4	2.84	"	63.0	72.7	8.06	"
				63.0	72.6	8.02	"
-28.7	51.5	3.22	Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O	68.9	76.4	9.80	"
-17.3	53.1	3.43	"				
- 3.7	55.1	3.72	"	85.6	80.9	12.83	lower hydrate
4.3	56.6	3.95	"	121.8	84.7	16.76	"
22.1	60.2	4.58	"				
38.9	64.3	5.45	Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O (metastable equil)				
43.9 <sup>b</sup>	66.3	5.96	"				
55.0 <sup>b</sup>	71.2	7.49	"				
60.7 <sup>b</sup>	74.4	8.80	"				

a. Molalities calculated by the compilers.

b. Isothermal method.

#### AUXILIARY INFORMATION

<b>METHOD/APPARATUS/PROCEDURE:</b>  For most of the determinations the synthetic method was used. The temperatures of crystallization were determined visually. Two data points were determined by the isothermal method.  No other information given.	<b>SOURCE AND PURITY OF MATERIALS:</b>  Nd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O was prepared by dissolving Nd <sub>2</sub> O <sub>3</sub> (purity of 99.5 %) in nitric acid followed by crystallization.  Doubly distilled water was used.
	<b>ESTIMATED ERROR:</b>  Solv: for data based on the synthetic method, reproducibility appears to be around ± 0.5 %. Isothermal measurements also appear to be precise to ± 0.5 % (compilers).  Temp: Authors state temperature control was ± 0.02 K.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neodymium nitrate; $\text{Nd}(\text{NO}_3)_3$ ; [10045-95-1] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	<ol style="list-style-type: none"> <li>Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 88-93.</li> <li>Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u>, 257-62.</li> <li>Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u>, <u>21</u>, 474-88.</li> </ol>
VARIABLES:	PREPARED BY:

One temperature: 25.00°C

T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

The solubility of  $\text{Nd}(\text{NO}_3)_3$  in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 4.582 mol  $\text{kg}^{-1}$ , but the preferred value is given in source papers [1] and [2] as 4.6184 mol  $\text{kg}^{-1}$ .

## COMMENTS AND/OR ADDITIONAL DATA:

Source paper [1] reports the relative viscosity,  $\eta_R$ , of a saturated solution to be 20.440. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated  $\text{Nd}(\text{NO}_3)_3$  solution at 25°C is 0.18198 poise (compilers' calculation).

Supplementary data available in the microfilm edition to *J. Phys. Chem.* 1975, 79 have enabled compilers to provide the following additional data.

The density of the saturated solutions was calculated by the compilers from the smoothing equation, and at 25°C the value is 1.8400  $\text{kg m}^{-3}$ . Using this density, the solubility in volume units is (based on the preferred value of 4.6184 mol  $\text{kg}^{-1}$ )

$$c_{\text{satd}} = 3.365 \text{ mol dm}^{-3}$$

Source paper [2] reports the electrolyte conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent)  $\kappa = 0.021295 \text{ S cm}^{-1}$ .

The molar conductivity of the saturated solution is calculated from  $1000 \kappa / 3c_{\text{satd}}$  and is

$$\Lambda (\frac{1}{3} \text{Nd}(\text{NO}_3)_3) = 2.109 \text{ S cm}^2 \text{ mol}^{-1}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (3). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	<p><math>\text{Nd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}</math> was prep by addn of <math>\text{HNO}_3</math> to the oxide. The oxide was purified by an ion exchange method and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15 %.</p> <p>In source paper [3] the salt was analysed for water of hydration and found to be within <math>\pm 0.016</math> water molecules of the hexahydrate.</p>
	<p>ESTIMATED ERROR: Solv: duplicate analyses agreed to at least <math>\pm 0.1</math> %. Temp: not specified, but probably accurate to at least <math>\pm 0.01</math> K as in (3) (comp)</p>
	REFERENCES:
	<ol style="list-style-type: none"> <li>Spedding, F.H.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u>, <u>78</u>, 1106.</li> <li>Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u>, <u>70</u>, 2440.</li> <li>Spedding, F.H.; et.al. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 72.</li> </ol>

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Samarium nitrate; $\text{Sm}(\text{NO}_3)_3$ ; [10361-83-8] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]		Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta.</i> , 1964, 47, 14-27.		
VARIABLES:		PREPARED BY:		
Temperature				
T. Mioduski and S. Siekierski				
EXPERIMENTAL VALUES:				
Solubility in the system $\text{Sm}(\text{NO}_3)_3-\text{H}_2\text{O}$ <sup>a</sup>				
$t/\text{ }^{\circ}\text{C}$	mass %	$\text{mol kg}^{-1}$		
0	54.74	3.596		
10	56.50	3.861		
20	58.04	4.112		
35	61.20	4.689		
50	64.68	5.444		
a. Molalities calculated by the compilers.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The isothermal method was used. Sm was determined by complexometric titration using xylenol orange indicator in the presence of a small quantity of urotropine buffer. Water was determined by difference. The solid phase is $\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ .	Samarium nitrate was prepared from $\text{Sm}_2\text{O}_3$ of purity better than 99.7 % (obtained by the ion exchange chromatography).			
ESTIMATED ERROR:				
Solv: precision about $\pm 0.2$ % (compilers). Temp: precision probably better than $\pm 0.05$ K (compilers).				
REFERENCES:				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Samarium nitrate; $\text{Sm}(\text{NO}_3)_3$ ; [10361-83-8] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	Popov, A.P.; Mironov, K.E. <i>Rev. Rown. Chim.</i> 1968, 13, 765-73.
VARIABLES:	PREPARED BY:
Temperature: range -30 to 135°C	T. Mioduski and S. Siekierski

## EXPERIMENTAL VALUES:

Solubility of  $\text{Sm}(\text{NO}_3)_3$  as a function of temperature <sup>a</sup>

t/°C	mass %	mol kg <sup>-1</sup>	solid phase	t/°C	mass %	mol kg <sup>-1</sup>	solid phase
- 2.1	19.2	0.71	ice	63.8	71.4	7.42	$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ <sup>b</sup>
- 3.9	25.1	1.00	"	71.2 <sup>c</sup>	75.0	8.92	"
- 8.5	33.7	1.51	"	73.0	76.2	9.52	"
-11.9	38.0	1.82	"				
-15.9	42.5	2.20	"	-36.7	54.4	3.55	$\text{Sm}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ <sup>b</sup>
-20.3	46.5	2.58	"	53.8	67.0	6.04	$\text{Sm}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$
-26.5	49.9	2.96	"	65.8	69.1	6.65	"
-33.5	52.9	3.34	"	76.9	73.4	8.20	"
				83.6	75.8	9.31	"
-30.0	51.9	3.21	$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$	82.8	76.8	9.84	"
- 4.8	54.1	3.50	"	88.4	79.9	11.82	"
13.8	56.4	3.85	"	86.4	83.3	14.83	"
30.3	60.2	4.50	"				
41.4	63.4	5.15	"	86.9	83.4	14.94	lower hydrate
				135.0	86.3	18.73	"

a. Molalities calculated by M. Salomon.

b. Metastable equilibrium.

c. This solubility value was determined by the isothermal method.

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The synthetic method was used. The temperatures of crystallization were determined visually.	$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was obtained by dissolving $\text{Sm}_2\text{O}_3$ of 99.5 % purity in $\text{HNO}_3$ and crystn. Water bidistd.
ESTIMATED ERROR:	Nothing specified.
REFERENCES:	

## Samarium nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Samarium nitrate; $\text{Sm}(\text{NO}_3)_3$ ; [10361-83-8] (2) Water; $\text{H}_2\text{O}$ ; [7732-18-5]	<ol style="list-style-type: none"> <li>Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 88-93.</li> <li>Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u>, 257-62.</li> <li>Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u>, <u>21</u>, 474-88.</li> </ol>
VARIABLES:  One temperature: $25.00^\circ\text{C}$	PREPARED BY:  T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

The solubility of  $\text{Sm}(\text{NO}_3)_3$  in water at  $25.00^\circ\text{C}$  has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be  $4.284 \text{ mol kg}^{-1}$ , but the preferred value is given in source papers [1] and [2] as  $4.2811 \text{ mol kg}^{-1}$ .

## COMMENTS AND/OR ADDITIONAL DATA:

Source paper [1] reports the relative viscosity,  $\eta_R$ , of a saturated solution to be 15.883. Taking the viscosity of water at  $25^\circ\text{C}$  to equal 0.008903 poise, the viscosity of a saturated  $\text{Sm}(\text{NO}_3)_3$  solution at  $25^\circ\text{C}$  is 0.1410 poise (compilers calculation).

Supplementary data available in the microfilm edition to *J. Phys. Chem.* 1975, 79, have enabled the compilers to provide the following additional data.

The density of the saturated solution was calculated by the compilers from the smoothing equation, and at  $25^\circ\text{C}$  the value is  $1.8269 \text{ kg m}^{-3}$ . Using this density, the solubility in volume units is (based on the preferred value of  $4.2811 \text{ mol kg}^{-1}$ )

$$c_{\text{satd}} = 3.2054 \text{ mol dm}^{-3}$$

Source paper [2] reports the electrolyte conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent)  $\kappa = 0.029531 \text{ S cm}^{-1}$ .

The molar conductivity of the saturated solution is calculated from  $1000 \kappa / 3c_{\text{satd}}$  and is

$$\Lambda(\frac{1}{3}\text{Sm}(\text{NO}_3)_3) = 3.071 \text{ S cm}^2 \text{ mol}^{-1}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (3). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1 % or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was prep'd by addn of $\text{HNO}_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15 %.
	In source paper (3) the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate.
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1$ %. Temp: not specified, but probably accurate to at least $\pm 0.01$ K as in (3)(compilers).
	REFERENCES:
	<ol style="list-style-type: none"> <li>Spedding, F.H.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u>, <u>78</u>, 1106.</li> <li>Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u>, <u>70</u>, 2440.</li> <li>Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u>, <u>20</u>, 72.</li> </ol>

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Samarium nitrate; Sm(NO <sub>3</sub> ) <sub>3</sub> ; [10361-83-8] (2) Water; H <sub>2</sub> O; [7732-18-5]	<p>1. Spedding, F.H.; Shiers, L.E.; Brown, M.A.; Baker, J.L.; Guitierrez, L.; McDowell, L.S.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1975</u>, <b>79</b>, 1087-96;</p> <p>2. Rard, J.A.; Shiers, L.E.; Heiser, D.J.; Spedding, F.H. <i>J. Chem. Eng. Data</i> <u>1977</u>, <b>22</b>, 337-47.</p>
VARIABLES:	PREPARED BY:
One temperature: 25.00°C	T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

Source paper [1] reports a solubility of 4.2800 mol kg<sup>-1</sup>

Source paper [2] reports a solubility of 4.2774 mol kg<sup>-1</sup>

The solid phase in both studies is the hexahydrate Sm(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O

Source paper [1] reports a density of the saturated solution of 1.82668 kg m<sup>3</sup>. Using this density value, the compilers have calculated the solubility in volume units (based on the value of 4.2800 mol kg<sup>-1</sup> given for the saturated solution in source paper [1]):

$$C_{\text{satd}} = 3.2046 \text{ mol dm}^{-3}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1 % or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	Sm(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O was prep'd by addn of HNO <sub>3</sub> to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15 %.
ESTIMATED ERROR:	<p>Solv: duplicate analyses agreed to at least ± 0.1 %.</p> <p>Temp: not specified, but probably accurate to at least ± 0.01 K as in (3).</p>
REFERENCES:	<p>1. Spedding, F.H.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u>, <b>78</b>, 1106.</p> <p>2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u>, <b>70</b>, 2440.</p> <p>3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u>, <b>20</b>, 72.</p>

COMPONENTS:				ORIGINAL MEASUREMENTS:			
(1) Europium nitrate; Eu(NO <sub>3</sub> ) <sub>3</sub> ; [10138-01-9]				Mironov, K.E.; Popov, A.P.; Vorob'eva, V. Ya.; Grankina, Z.A. <i>Zh. Neorg. Khim.</i> 1971, 16, 2769-74; <i>Russ. J. Inorg. Chem. Engl. Transl.</i> 1971, 16, 1476-9.			
(2) Water ; H <sub>2</sub> O ; [7732-18-5]							

VARIABLES:				PREPARED BY:			
Temperature				T. Mioduski, S. Siekierski, and M. Salomon			

EXPERIMENTAL VALUES: Composition of saturated solutions as a function of temperature <sup>a,b</sup>							
t/°C	Eu(NO <sub>3</sub> ) <sub>3</sub> mass %	Eu(NO <sub>3</sub> ) <sub>3</sub> mol kg <sup>-1</sup>	solid phase	t/°C	Eu(NO <sub>3</sub> ) <sub>3</sub> mass %	Eu(NO <sub>3</sub> ) <sub>3</sub> mol kg <sup>-1</sup>	solid phase
0.0	0.0	—	A	30.5	60.6	4.55	C
-1.2	10.3	0.34	"	37.0	60.8	4.59	"
-2.3	13.6	0.47	"	45.1	62.1	4.85	? <sup>c</sup>
-2.8	14.6	0.51	"	38.1	62.7	4.97	?
-9.9	30.2	1.28	"	47.1	64.8	5.45	C
-11.4	35.1	1.60	"	53.5	65.4	5.59	?
-18.1	39.7	1.95	"	56.8	66.5	5.87	?
-22.0	44.1	2.33	"	54.7	67.1	6.03	C
-25.8	47.0	2.62	"	59.0	67.5	6.15	D
-28.1	48.6	2.80	"	73.0	70.6	7.11	"
-31.6	50.3	2.99	B	74.0	71.4	7.39	?
-32.1	52.2	3.23	"	77.4	73.2	8.08	D
-20.5	53.5	3.40	"	87.0	75.8	9.27	?
-1.8	54.7	3.57	"	77.5	78.6	10.87	?
15.4	57.0	3.92	"	89.2	83.7	15.19	D <sup>d</sup>
26.2	58.4	4.15	"				

a. Molalities calculated by the compilers.

b. Solid phases: A = ice ; B = Eu(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O

C = Eu(NO<sub>3</sub>)<sub>3</sub>·5H<sub>2</sub>O ; D = Eu(NO<sub>3</sub>)<sub>3</sub>·4H<sub>2</sub>O

c. Metastable equilibria. Solid phases not specified.

d. Theoretical concentration at the congruent melting point is 13.88 mol kg<sup>-1</sup> (compilers).

#### AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:												
The synthetic method was used supplemented with differential thermal analyses of the various hydrates. The solubilities were determined by visual recording of the temperatures of crystallization. The DTA studies show that the hexahydrate and pentahydrate are incongruently soluble. The tetrahydrate is congruently soluble and melted at 91.15°C.	Europium nitrate was prep by dissolving 99.5% pure oxide in warm nitric acid followed by evaporation to crystallization. 35.4 mass % Eu was found by EDTA titrn, 43.3 mass % NO <sub>3</sub> was found by the Kjeldahl method, and 22.1 mass % water was found by the Karl Fischer method. Theoretical for the penta-hydrate are: 35.50 mass % Eu, 43.46 mass % NO <sub>3</sub> , and 21.04 mass % H <sub>2</sub> O (compilers).												
COMMENTS AND/OR ADDITIONAL DATA:	Europium nitrate with less waters of hydration was prepared by drying at 100-120°C <i>in vacuo</i> .												
The coordinates of the invariant points appear to have been determined graphically, and are:	ESTIMATED ERROR:												
<table border="1"> <thead> <tr> <th>t/°C</th> <th>mass %</th> <th>mol kg<sup>-1</sup></th> </tr> </thead> <tbody> <tr> <td>-36</td> <td>52.0</td> <td>3.21</td> </tr> <tr> <td>33</td> <td>60.1</td> <td>4.46</td> </tr> <tr> <td>60</td> <td>76.4</td> <td>9.58</td> </tr> </tbody> </table>	t/°C	mass %	mol kg <sup>-1</sup>	-36	52.0	3.21	33	60.1	4.46	60	76.4	9.58	Nothing specified.
t/°C	mass %	mol kg <sup>-1</sup>											
-36	52.0	3.21											
33	60.1	4.46											
60	76.4	9.58											
REFERENCES:													

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Gadolinium nitrate; $\text{Gd}(\text{NO}_3)_3$ ; [10168-81-7]	Moret, R. <i>Thèse. L'Université de Lausanne.</i> <u>1963.</u>
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	
VARIABLES:	PREPARED BY:

Temperature: range 0°C to 50°C

T. Mioduski and Siekierski

## EXPERIMENTAL VALUES:

Solubility of  $\text{Gd}(\text{NO}_3)_3$ <sup>a</sup>

t/°C	mass %	$\text{mol kg}^{-1}$	nature of the solid phase
0	56.34 <sup>b</sup>	3.759	$\text{Gd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$
10	57.89	4.005	"
20	59.60 <sup>c</sup>	4.298	"
40	63.44	5.055	"
50	65.23 <sup>d</sup>	5.465	"

a. Molalities calculated by the compilers.

b. This soly reported in (1) as 1475 moles  $\text{H}_2\text{O}$  per 100 moles of  $\text{Gd}(\text{NO}_3)_3$ .c. This soly reported in (1) as 1290 moles  $\text{H}_2\text{O}$  per 100 moles of  $\text{Gd}(\text{NO}_3)_3$ .d. This soly reported in (1) as 1015 moles  $\text{H}_2\text{O}$  per 100 moles of  $\text{Gd}(\text{NO}_3)_3$ .

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The isothermal method was used. Gadolinium was determined by complexometric titration with the disodium salt of ethylenediamine-tetraacetic acid using Xylenol orange indicator and urotropine buffer. Water was determined by difference.	$\text{Gd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was prepared from $\text{Gd}_2\text{O}_3$ of purity better than 99.7 % (obtained by the ion chromatography method). No additional details available.
	ESTIMATED ERROR: Soly: precision about $\pm 0.2\%$ (compilers). Temp: precision probably $\pm 0.01\text{ K}$ or better (compilers).
	REFERENCES: 1. Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , <i>47</i> , 14.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Gadolinium nitrate; $\text{Gd}(\text{NO}_3)_3$ ; [10168-81-7]	1. Spedding, F.H.; Shiers, L.E.; Pard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93. 2. Rard, J.A.: Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62.
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	3. Spedding, F.H.; Shiers, L.E.; Brown, M.A.; Baker, J.L.; Guitierrez, L.; McDowell, L.S.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 1087-96. 4. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.
VARIABLES:	PREPARED BY: T. Mioduski, S. Siekierski, and M. Salomon.
One temperature: $25.00^\circ\text{C}$	

## EXPERIMENTAL VALUES:

The solubility of  $\text{Cd}(\text{NO}_3)_3$  in water at  $25.00^\circ\text{C}$  has been reported by Spedding and co-workers in four publications. Source paper [4] reports the solubility to be  $4.400 \text{ mol kg}^{-1}$ , but the preferred value is given in source papers [1] - [3] as  $4.3766 \text{ mol kg}^{-1}$ .

## COMMENTS AND/OR ADDITIONAL DATA:

Source paper [1] reports the relative viscosity,  $\eta_R$ , of a saturated solution to be 17.850. Taking the viscosity of water at  $25^\circ\text{C}$  to equal 0.008903 poise, the viscosity of a saturated  $\text{Gd}(\text{NO}_3)_3$  solution at  $25^\circ\text{C}$  is 0.15892 poise (compilers calculation).

Supplementary data available in the microfilm edition to *J. Phys. Chem.* 1975, 79 and in source paper [3] enabled the compilers to provide the following additional data.

The density of the saturated solutions was calculated by the compilers from the smoothing equation, and at  $25^\circ\text{C}$  the value is  $1.87056 \text{ kg m}^{-3}$ . Using this density, the solubility in volume units is (based on the preferred value of  $4.3766 \text{ mol kg}^{-1}$ )

$$c_{\text{satd}} = 3.2716 \text{ mol dm}^{-3}$$

Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent)  $\kappa = 0.029735 \text{ S cm}^{-1}$ .

The molar conductivity of the saturated solution is calculated from  $1000 \kappa / 3c_{\text{satd}}$  and is

$$\Lambda \left( \frac{1}{3} \text{Gd}(\text{NO}_3)_3 \right) = 3.030 \text{ S cm}^2 \text{ mol}^{-1}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1 % or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	$\text{Gd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was prep'd by addn of $\text{HNO}_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.  In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate. Water was distilled form an alkaline permanganate solution.
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: Not specified, but probably accurate to at least $\pm 0.01 \text{ K}$ as in (3) (compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.

## Gadolinium nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Gadolinium nitrate; $\text{Gd}(\text{NO}_3)_3$ ; [10168-81-7]	Rard, J.A.; Shiers, L.E.; Heiser, D.J.; Spedding, F.H. <i>J. Chem. Eng. Data</i> <u>1977</u> , 22, 337-47.
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	
VARIABLES:	
One temperature: $25.00^{\circ}\text{C}$	PREPARED BY: T. Mioduski and S. Siekierski
EXPERIMENTAL VALUES:	
The solubility of $\text{Gd}(\text{NO}_3)_3$ in water at $25^{\circ}\text{C}$ was reported to be $4.3701 \text{ mol kg}^{-1}$ .	
AUXILIARY INFORMATION	
METHOD APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS: 1. The nitrate was obtained from the oxide (purified by ion-exchange methods at the Ames Laboratory) and reagent grade $\text{HNO}_3$ . The purity of the oxide was greater than 99.85 mass % with Ca, Fe, Si and adjacent Ln being the only significant impurities. 2. Conductivity water distilled from alkaline $\text{KMnO}_4$ was used.
The isothermal-isopiestic method was used. The isopiestic equilibration consisted of allowing less than satd gadolinium nitrate soln to reach thermodynamic equil through the vapor phase with a reference soln. ( $\text{KCl}$ , $\text{CaCl}_2$ ). The solv was thus detd without sepn of the soln and solid phase. The solns were adjusted to their equivalence pH values to ensure a ratio of three nitrates to each Gd ion. Duplicate samples of the nitrate and reference soln were used and equil was approached from higher and lower concns (about 4 days). The satd soln was analysed by EDTA and gravimetric sulfate methods. The nitrate samples were evaporated with $\text{HCl}$ before conversion to the sulfates to destroy the nitrate ions and thereby avoid their copptn. The solid phase is $\text{Gd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ . The major objective of this paper was to determine the osmotic co-efficients of the lanthanide nitrates.	ESTIMATED ERROR: Solv: The average equil isopiestic molalities are known to at least $\pm 0.1\%$ , and they differ from direct analyses values by $0.07 - 0.17\%$ . Temp: accuracy $\pm 0.01 \text{ K}$ .
	REFERENCES:

COMPONENTS:		ORIGINAL MEASUREMENTS:
(1) Terbium nitrate; $Tb(NO_3)_3$ ; [10043-27-3]		1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93. 2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62. 3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.
(2) Water ; $H_2O$ ; [7732-18-5]		
VARIABLES:		PREPARED BY:
One temperature: 25.00°C		T. Mioduski, S. Siekierski, and M. Salomon
EXPERIMENTAL VALUES:		
The solubility of $Tb(NO_3)_3$ in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 4.738 mol kg <sup>-1</sup> , but the preferred value is given in source papers [1] and [2] as 4.5395 mol kg <sup>-1</sup> .		
COMMENTS AND/OR ADDITIONAL DATA:		
Source paper [1] reports the relative viscosity, $\eta_R$ , of a saturated solution to be 20.152. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated $Tb(NO_3)_3$ solution at 25°C is 0.17941 poise (compilers' calculation).		
Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> enabled the compilers to provide the following additional data.		
The density of the saturated solutions was calculated by the compilers from the smoothing equation, and at 25°C the value is 1.89977 kg m <sup>-3</sup> . Using this density, the solubility in volume units is (based on the preferred value of 4.5395 mol kg <sup>-1</sup> )		
$c_{satd} = 3.4030 \text{ mol dm}^{-3}$		
Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent) $\kappa = 0.027639 \text{ S cm}^{-1}$ .		
The molar conductivity of the saturated solution is calculated from $1000\kappa / 3c_{satd}$ and is $\Lambda(\frac{1}{3} Tb(NO_3)_3) = 2.707 \text{ S cm}^2 \text{ mol}^{-1}$ (compilers' calculation)		
It should be noted that in the supplementary data in the microfilm edition of source paper [2], this latter quantity is given as 2.741 S cm <sup>2</sup> mol <sup>-1</sup> .		
AUXILIARY INFORMATION		
METHOD APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:	
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	$Tb(NO_3)_3 \cdot 6H_2O$ was prep'd by addn of $HNO_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.	
	In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate. Water was distilled from an alkaline permanganate solution.	
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: Not specified, but probably accurate to at least $\pm 0.01$ K as in (3) (compilers).	
	REFERENCES:	
	1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Terbium nitrate; Tb(NO <sub>3</sub> ) <sub>3</sub> ; [10043-27-3]	[1] Spedding, F.H.; Shiers, L.E.; Brown, M.A.; Baker, J.L.; Guitierrez, L.; McDowell, L.S.; Habenschuss, A. <i>J. Phys. Chem.</i> 1975, 79, 1078-96. [2] Rard, J.A.; Shiers, L.E.; Heiser, D.J.; Spedding, F.H. <i>J. Chem. Eng. Data</i> 1977, 22, 337-37.
VARIABLES:  One temperature: 25.00°C	PREPARED BY:  T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

Source paper [1] reports the solubility of Tb(NO<sub>3</sub>)<sub>3</sub> as 4.5395 mol kg<sup>-1</sup>.

Source paper [2] reports the solubility of Tb(NO<sub>3</sub>)<sub>3</sub> as 4.5320 mol kg<sup>-1</sup>.

The solid phase in both studies is the hexahydrate, Tb(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:  [1] Standard isothermal method used. [2] Isothermal isopiestic method used in which equilibration carried out by allowing a less than satd Tb(NO <sub>3</sub> ) <sub>3</sub> sln to reach thermodynamic equilibrium through the vapor phase with a reference sln (KC <sub>1</sub> , CaCl <sub>2</sub> ). The solv was thus detd without sepn of the sln and solid phases. The solutions were adjusted to their equivalence pH values to insure a ratio of three nitrates to each Tb. Duplicate samples of the nitrate and reference slns were used and equil was approached from higher and lower concns (about 4d).  In both [1] and [2] the satd slns were analysed by EDTA titrn and gravimetric sulfate analysis. The methods are stated to be accurate to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	SOURCE AND PURITY OF MATERIALS:  1. The nitrate was obtained from the oxide (purified by ion-exchange methods at the Ames Laboratory) and reagent grade HNO <sub>3</sub> . The purity of the oxide was greater than 99.85 mass % with Ca, Fe, Si and adjacent lanthanides being the only significant impurities. 2. Conductivity water distd. from an alkaline KMnO <sub>4</sub> solution was used.
ESTIMATED ERROR:  Solv: duplicate analyses agreed to at least ± 0.1%. Temp: precision ± 0.01 K.	REFERENCES:

COMPONENTS: (1) Dysprosium nitrate; Dy(NO <sub>3</sub> ) <sub>3</sub> ; [10143-38-1] (2) Water ; H <sub>2</sub> O ; [7732-18-5]	ORIGINAL MEASUREMENTS: Moret, R. <i>Thèse</i> . 1'Université de Lausanne. <u>1963.</u>
VARIABLES: Temperature: range 0 to 50°C	PREPARED BY: T. Mioduski and S. Siekierski

## EXPERIMENTAL VALUES:

t/°C	Dy(NO <sub>3</sub> ) <sub>3</sub> mass %	mol kg <sup>-1a</sup>	solid phase
0	58.80 <sup>b</sup>	4.095	Dy(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O
10	60.03	4.309	"
20	61.73 <sup>c</sup>	4.628	"
40	65.76	5.510	"
50	67.88 <sup>d</sup>	6.064	"

- a. Calculated by the compilers.
- b. 1355 moles of H<sub>2</sub>O per 100 moles of Dy(NO<sub>3</sub>)<sub>3</sub> (1).
- c. 1199 moles of H<sub>2</sub>O per 100 moles of Dy(NO<sub>3</sub>)<sub>3</sub> (1).
- d. 915.3 moles of H<sub>2</sub>O per 100 moles of Dy(NO<sub>3</sub>)<sub>3</sub> (1).

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:  Isothermal method employed (1). Dy was determined by complexometric titration using Xylenol Orange indicator in presence of a small amount of urotropine buffer. Water was determined by difference.	SOURCE AND PURITY OF MATERIALS:  Dy(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O was prepared from Dy <sub>2</sub> O <sub>3</sub> of purity higher than 99.7% (obtained by the ion exchange chromatography). No additional details available.
COMMENTS AND/OR ADDITIONAL DATA:  Data for 0°C, 20°C, and 50°C were converted to units of moles water per 100 moles of salt and reported in reference (1).	ESTIMATED ERROR: Solv: precision about $\pm$ 0.2 % (compilers). Temp: precision at least $\pm$ 0.05K (compilers).
	REFERENCES: 1. Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , 47, 14.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Dysprosium nitrate; Dy(NO <sub>3</sub> ) <sub>3</sub> ; [10143-38-1]	1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93. 2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62. 3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.
(2) Water ; H <sub>2</sub> O ; [7732-18-5]	
VARIABLES:	PREPARED BY:

One temperature: 25.00°C

T. Mioduski, S. Siekierski, and M. Salomon

#### EXPERIMENTAL VALUES:

The solubility of Dy(NO<sub>3</sub>)<sub>3</sub> in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 4.539 mol kg<sup>-1</sup>, but the preferred value is given in source papers [1, 2] as 4.539 mol kg<sup>-1</sup>.

#### COMMENTS AND/OR ADDITIONAL DATA:

Source paper [1] reports the relative viscosity,  $\eta_R$ , of a saturated solution to be 24.008. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated Dy(NO<sub>3</sub>)<sub>3</sub> solution at 25°C is 0.2137 poise (compilers calculation).

Supplementary data available in the microfilm edition to *J. Phys. Chem.* 1975, 79 enabled the compilers to provide the following additional data.

The density of the saturated solution was calculated by the compilers from the smoothing equation, and at 25°C the value is 1.94030 kg m<sup>-3</sup>. Using this density, the solubility in volume units is (based on the preferred value of 4.7382 mol kg<sup>-1</sup>).

$$c_{\text{satd}} = 3.4675 \text{ mol dm}^{-3}$$

Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent)  $\kappa = 0.024354 \text{ S cm}^{-1}$ .

The molar conductivity of the saturated solution is calculated from  $1000\kappa/3c_{\text{satd}}$  and is

$$\Lambda(\frac{1}{3}\text{Dy(NO}_3)_3) = 2.341 \text{ S cm}^2 \text{ mol}^{-1}$$

#### AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	Dy(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O prep by addn of HNO <sub>3</sub> to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.  In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate.  Water was distilled from an alkaline permanganate solution.
	ESTIMATED ERROR:
	Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: Not specified, but probably accurate to at least $\pm 0.01$ K as in (3) (compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.

## Holmium nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Holmium nitrate; $\text{Ho}(\text{NO}_3)_3$ ; [10168-82-8]	1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93.
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62.
	3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.
VARIABLES:	PREPARED BY:
One temperature: 25.00°C	T. Mioduski, S. Siekierski, and M. Salomon
EXPERIMENTAL VALUES:	
<p>The solubility of <math>\text{Ho}(\text{NO}_3)_3</math> in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 5.027 mol kg<sup>-1</sup>, but the preferred values are given in source papers [1] and [2] as 5.0184 mol kg<sup>-1</sup> and 5.0183 mol kg<sup>-1</sup>, respectively.</p>	
COMMENTS AND/OR ADDITIONAL DATA:	
<p>Source paper [1] reports the relative viscosity, <math>\eta_R</math>, of a saturated solution to be 29.773. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated <math>\text{Ho}(\text{NO}_3)_3</math> solution at 25°C is 0.26507 poise (compilers calculation).</p>	
<p>Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u>, enabled the compilers to provide the following additional data.</p>	
<p>The density of the saturated solution was calculated by the compilers from the smoothing equation, and at 25°C the value is 1.98393 kg m<sup>-3</sup>. Using this density, the solubility in volume units is (based on the preferred value of 5.0183 mol kg<sup>-1</sup>)</p>	
$c_{\text{satd}} = 3.6057 \text{ mol dm}^{-3}$	
<p>Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent <math>\kappa = 0.020598 \text{ S cm}^{-1}</math>).</p>	
<p>The molar conductivity of the saturated solution is calculated from <math>1000 / 3c_{\text{satd}}</math> and is</p>	
$\Lambda(\frac{1}{3} \text{ Ho}(\text{NO}_3)_3) = 1.904 \text{ S cm}^2 \text{ mol}^{-1}$	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS: $\text{Ho}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was prep'd by addn of $\text{HNO}_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%. In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate. Water was distilled from an alkaline permanganate solution.
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	ESTIMATED ERROR: Soly: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: not specified, but probably accurate to at least $\pm 0.01 \text{ K}$ as in (3)(compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.

COMPONENTS:	ORIGINAL MEASUREMENTS:																								
(1) Erbium nitrate; $\text{Er}(\text{NO}_3)_3$ ; [10168-80-6]	Moret, R. <i>Thèse.</i> 1 <sup>er</sup> Université de Lausanne. 1963.																								
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]																									
VARIABLES:	PREPARED BY:																								
Temperature: range 0 to 50°C	T. Mioduski and S. Siekierski																								
EXPERIMENTAL VALUES:																									
<table> <thead> <tr> <th style="text-align:left;">t /°C</th> <th style="text-align:left;">mass %</th> <th style="text-align:left;"><math>\text{Er}(\text{NO}_3)_3</math> mol kg<sup>-1</sup>a</th> <th style="text-align:left;">solid phase</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>61.59</td> <td>4.539</td> <td><math>\text{Er}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}</math></td> </tr> <tr> <td>10</td> <td>63.10</td> <td>4.841</td> <td>"</td> </tr> <tr> <td>20</td> <td>64.91</td> <td>5.236</td> <td>"</td> </tr> <tr> <td>40</td> <td>68.64</td> <td>6.196</td> <td>"</td> </tr> <tr> <td>50</td> <td>70.99</td> <td>6.927</td> <td>"</td> </tr> </tbody> </table> <hr/>		t /°C	mass %	$\text{Er}(\text{NO}_3)_3$ mol kg <sup>-1</sup> a	solid phase	0	61.59	4.539	$\text{Er}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$	10	63.10	4.841	"	20	64.91	5.236	"	40	68.64	6.196	"	50	70.99	6.927	"
t /°C	mass %	$\text{Er}(\text{NO}_3)_3$ mol kg <sup>-1</sup> a	solid phase																						
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50	70.99	6.927	"																						
a. Calculated by the compilers.																									
AUXILIARY INFORMATION																									
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:																								
Isothermal method employed (1). Er was determined by complexometric titration using Xylenol Orange indicator in the presence of a small amount of urotropine buffer. Water was determined by difference.	$\text{Er}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ was prepared from $\text{Er}_2\text{O}_3$ of purity better than 99.7% (obtained by the ion exchange chromatography). No additional details available.																								
ESTIMATED ERROR: Soly: precision about $\pm 0.2\%$ (compilers). Temp: precision at least $\pm 0.05\text{ K}$ (compilers).																									
REFERENCES:																									
1. Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , 47, 14.																									

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Erbium nitrate; $\text{Er}(\text{NO}_3)_3$ ; [10168-80-6]	1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93.
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62.
VARIABLES:	PREPARED BY:
One temperature: 25.00°C	T. Mioduski, S. Siekierski and M. Salomon
EXPERIMENTAL VALUES:	
<p>The solubility of <math>\text{Er}(\text{NO}_3)_3</math> in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be <math>5.456 \text{ mol kg}^{-1}</math>, but the preferred value is given in source papers [1] and [2] as <math>5.4348 \text{ mol kg}^{-1}</math>.</p>	
COMMENTS AND/OR ADDITIONAL DATA:	
<p>Source paper [1] reports the relative viscosity, <math>\eta_R</math>, of a saturated solution to be 41.240. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated <math>\text{Er}(\text{NO}_3)_3</math> solution at 25°C is 0.3672 poise (compilers calculation).</p>	
<p>Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> <u>1975</u>, <u>79</u> enabled the compilers to provide the following additional data.</p>	
<p>The density of the saturated solutions was calculated by the compilers from the smoothing equation, and at 25°C the value is <math>2.04068 \text{ kg m}^{-3}</math>. Using this density, the solubility in volume units is (based on the preferred value of <math>5.4348 \text{ mol kg}^{-1}</math>)</p>	
$c_{\text{satd}} = 3.7982 \text{ mol dm}^{-3}$	
<p>Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent) <math>\kappa = 0.015798 \text{ S cm}^{-1}</math>.</p>	
<p>The molar conductivity of the saturated solution is calculated from <math>1000\kappa/3c_{\text{satd}}</math> and is</p>	
$\Lambda(\frac{1}{3} \text{Er}(\text{NO}_3)_3) = 1.386 \text{ S cm}^2 \text{ mol}^{-1}$	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:  $\text{Er}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ was prep'd by addn of $\text{HNO}_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.  In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the hexahydrate. Water was distilled from an alkaline permanganate solution.
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: not specified, but probably accurate to at least $\pm 0.01 \text{ K}$ as in (3)(compilers).
	REFERENCES: 1. Spedding, F.H.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Thulium nitrate; Tm(NO <sub>3</sub> ) <sub>3</sub> ; [14985-19-4]	1. Rard, J.A.; Shiers, L.E.; Heiser, D.J.; Spedding, F.H. <i>J. Chem. Eng. Data</i> <u>1977</u> , 22, 337-47. 2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , 79, 257-62. 3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , 21, 474-88.
VARIABLES:	PREPARED BY:
One temperature: 25.00°C	T. Mioduski, S. Siekierski and M. Salomon

## EXPERIMENTAL VALUES:

Source paper [1] reports the solubility of Tm(NO<sub>3</sub>)<sub>3</sub> as 5.9526 mol kg<sup>-1</sup>

Source paper [2] reports the solubility of Tm(NO<sub>3</sub>)<sub>3</sub> as 5.9483 mol kg<sup>-1</sup>

Source paper [3] reports the solubility of Tm(NO<sub>3</sub>)<sub>3</sub> as 6.028 mol kg<sup>-1</sup>

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
[2] and [3] Standard isothermal method used. Solutions prepared as in (1) and (2). [1] Isothermal isopiestic method used in which equilibration carried out by allowing a less than satd Tm(NO <sub>3</sub> ) <sub>3</sub> sln to reach thermodynamic equilibrium through the vapor phase with a reference sln (KC1, CaCl <sub>2</sub> ). The solv was thus detd without sepn of the sln and solid phases. The solutions were adjusted to their equivalence pH values to insure a ratio of three nitrates to each Tm. Duplicate samples of the nitrate and reference slns were used and equil was approached from higher and lower concns (about 4 days).  In [1], [2] and [3] the satd slns were analysed by EDTA titrn and gravimetric sulfate analysis. The methods are stated to be accurate to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	Tm(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O was prep'd by addn of HNO <sub>3</sub> to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.  In source paper [3] the salt was analysed for water of hydration and found to be within ± 0.016 water molecules of the hexahydrate. Water was distilled from an alkaline permanganate solution.
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least ± 0.1%. Temp: not specified, but probably accurate to at least ± 0.01 K as in (3)(compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , 78, 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , 70, 2440. 3. Spedding, F.H.; et. al <i>J. Chem. Eng. Data</i> <u>1975</u> , 20, 72.

COMPONENTS: (1) Ytterbium nitrate; $\text{Yb}(\text{NO}_3)_3$ ; [13768-67-7]  (2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	ORIGINAL MEASUREMENTS: Moret, R. <i>Thèse. 1'Université de Lausanne.</i> <u>1963.</u>
VARIABLES: Temperature: range $0^{\circ}\text{C}$ to $40^{\circ}\text{C}$	PREPARED BY: T. Mioduski and S. Siekierski

## EXPERIMENTAL VALUES:

Solubility<sup>a</sup>

t/ $^{\circ}\text{C}$	mass %	moles of water	$\text{mol kg}^{-1}$	solid phase
		per 100 moles salt		
0	65.76	1035	5.349	$\text{Yb}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$
10	67.51		5.787	"
15	68.28		5.995	"
20	69.50	875	6.346	"
40	73.91	703	7.890	"

a. Molalities calculated by compilers from mass % values.

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The isothermal method was used as described in (1). Yb was determined by complexometric titration using Xylenol Orange indicator in the presence of a small amount of urotropine buffer. Water was determined by difference.	Ytterbium nitrate was prepared from $\text{Yb}_2\text{O}_3$ of purity better than 99.7% (obtained by the ion exchange chromatographic method).
	ESTIMATED ERROR: Soly: precision about $\pm 0.1\%$ (compilers). Temp: precision at least $\pm 0.05\text{ K}$ (compilers).
	REFERENCES: 1. Brunisholz, G.; Quinche, J.P.; Kalo, A.M. <i>Helv. Chim. Acta</i> <u>1964</u> , <i>47</i> , 14.

## Ytterbium nitrate

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Ytterbium nitrate; $\text{Yb}(\text{NO}_3)_3$ ; [13768-67-7]	1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93.
(2) Water ; $\text{H}_2\text{O}$ ; [7732-18-5]	2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62.
	3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.

VARIABLES:	PREPARED BY:
One temperature: 25.00°C	T. Mioduski, S. Siekierski, and M. Salomon

## EXPERIMENTAL VALUES:

The solubility of  $\text{Yb}(\text{NO}_3)_3$  in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 6.650 mol kg<sup>-1</sup>, and in source papers [1] and [2] as 6.6500 mol kg<sup>-1</sup>.

## COMMENTS AND/OR ADDITIONAL DATA:

Source paper [1] reports the relative viscosity,  $\eta_R$ , of a saturated solution to be 124.32. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated  $\text{Yb}(\text{NO}_3)_3$  solution at 25°C is 1.1068 poise (compilers calculation).

Supplementary data available in the microfilm edition to *J. Phys. Chem.* 1975, 79 enabled the compilers to provide the following additional data.

The density of the saturated solution was calculated by the compilers from the smoothing equation, and at 25°C the value is 2.19776 kg m<sup>-3</sup>. Using this density, the solubility in volume units is

$$c_{\text{satd}} = 4.3141 \text{ mol dm}^{-3}$$

Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent)  $\kappa = 0.006548 \text{ S cm}^{-1}$ .

The molar conductivity of the saturated solution is calculated from  $1000\kappa/3c_{\text{satd}}$  and is

$$\Lambda(\frac{1}{3} \text{Yb}(\text{NO}_3)_3) = 0.506 \text{ S cm}^2 \text{ mol}^{-1}$$

## AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	$\text{Yb}(\text{NO}_3)_3 \cdot n\text{H}_2\text{O}$ was prep by addn of $\text{HNO}_3$ to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.
The composition of the solid phase was not specified in the source papers, but we assume it to be the hexahydrate (see the critical evaluation).	Water was distilled from an alkaline permanganate soltuion.
	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: Not specified, but probably accurate to at least $\pm 0.01 \text{ K}$ as in (3)(compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.

COMPONENTS:	ORIGINAL MEASUREMENTS: 1. Spedding, F.H.; Shiers, L.E.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 88-93. 2. Rard, J.A.; Spedding, F.H. <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> , 257-62. 3. Spedding, F.H.; Derer, J.L.; Mohs, M.A.; Rard, J.A. <i>J. Chem. Eng. Data</i> <u>1976</u> , <u>21</u> , 474-88.
VARIABLES:	PREPARED BY:  T. Mioduski, S. Siekierski, and M. Salomon
EXPERIMENTAL VALUES:	
The solubility of Lu(NO <sub>3</sub> ) <sub>3</sub> in water at 25.00°C has been reported by Spedding and co-workers in three publications. Source paper [3] reports the solubility to be 6.792 mol kg <sup>-1</sup> , but the preferred value is given in source paper [1] and [2] as 6.8219 mol kg <sup>-1</sup> .	
COMMENTS AND/OR ADDITIONAL DATA:	
Source paper [1] reports the relative viscosity, $\eta_R$ , of a saturated solution to be 149.92. Taking the viscosity of water at 25°C to equal 0.008903 poise, the viscosity of a saturated Lu(NO <sub>3</sub> ) <sub>3</sub> solution is 25°C is 1.3347 poise (compilers calculation).	
Supplementary data available in the microfilm edition to <i>J. Phys. Chem.</i> <u>1975</u> , <u>79</u> enabled the compilers to provide the following additional data.	
The density of the saturated solutions was calculated by the compilers from the smoothing equation, and at 25°C the value is 2.22323 kg m <sup>-3</sup> . Using this density, the solubility in volume units is (based on the preferred value of 6.8219 mol kg <sup>-1</sup> )	
$c_{\text{satd}} = 4.3801 \text{ mol dm}^{-3}$	
Source paper [2] reports the electrolytic conductivity of the saturated solution to be (corrected for the electrolytic conductivity of the solvent) $\kappa = 0.005660 \text{ S cm}^{-1}$ .	
The molar conductivity of the saturated solution is calculated from $1000\kappa/3c_{\text{satd}}$ and is	
$\Lambda(\frac{1}{3} \text{Lu}(\text{NO}_3)_3) = 0.431 \text{ S cm}^2 \text{ mol}^{-1}$	
AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:  Lu(NO <sub>3</sub> ) <sub>3</sub> ·5H <sub>2</sub> O was prep'd by addn of HNO <sub>3</sub> to the oxide. The oxide was purified by an ion exchange method, and the upper limit for the impurities Ca, Fe, Si and adjacent rare earths was given as 0.15%.  In source paper [3] the salt was analysed for water of hydration and found to be within $\pm 0.016$ water molecules of the pentahydrate. Water was distilled from an alkaline permanganate solution.
Isothermal method used. Solutions were prepared as described in (1) and (2). The concentration of the saturated solution was determined by both EDTA (1) and sulfate (2) methods which is said to be reliable to 0.1% or better. In the sulfate analysis, the salt was first decomposed with HCl followed by evaporation to dryness before sulfuric acid additions were made. This eliminated the possibility of nitrate ion coprecipitation.	ESTIMATED ERROR: Solv: duplicate analyses agreed to at least $\pm 0.1\%$ . Temp: Not specified, but probably accurate to at least $\pm 0.01$ K as in (3) (compilers).
	REFERENCES: 1. Spedding, F.G.; Cullen, P.F.; Habenschuss, A. <i>J. Phys. Chem.</i> <u>1974</u> , <u>78</u> , 1106. 2. Spedding, F.H.; Pikal, M.J.; Ayers, B.O. <i>J. Phys. Chem.</i> <u>1966</u> , <u>70</u> , 2440. 3. Spedding, F.H.; et. al. <i>J. Chem. Eng. Data</i> <u>1975</u> , <u>20</u> , 72.