246 Gadoliniun	n Unioriae
COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Merbach, A.; Pitteloud, M.N.; Jaccard, P. Helv. Chím. Acta <u>1972</u> , 55, 44-52.
(2) Methanol; CH ₄ 0; [67-56-1]	Pitteloud, M.N. These. Faculte des Sciences de l'Universite de Lausanne. <u>1971</u> .
VARIABLES:	PREPARED BY:
T/K = 298.2	T. Mioduski and M. Salomon
EXPERIMENTAL VALUES:	
	2
	mean solubility"
t/°C	mol kg ⁻¹
25	4.21
^a Initial salt was the adduct GdCl ₃ .4CH ₃ OH. yielded GdCl ₃ .4.1CH ₃ OH.	Analysis of the equilibrated solid phase
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE: Isothermal method as in (1,2). Mixtures were equilibrated for at least 4 days. Pro- longed operations were performed in a dry box. Gadolinium determined by titration with $(NH_4)_3H(EDTA)$ using a small amount of urotropine buffer and Xylenol Orange indica- tor. Chloride was determined by potentio- metric titration with AgNO ₃ solution. Com- position of the adduct GdCl ₃ .4CH ₃ OH con- firmed by ¹ H NMR and X-ray diffraction. The reported solubility is a mean of 2-4	SOURCE AND PURITY OF MATERIALS: Gd ₂ O ₃ of at least 99.9% purity dissolved in HCl to produce the hexahydrate. The ad- duct GdCl ₃ .4CH ₃ OH prepared by dissolving the hydrate in a small excess of o-methyl- formate followed by distillation and crystallization from methanol. Methanol was purified and dried by the Vogel method.
determinations.	ESTIMATED ERROR: Soly: precision <u>+</u> 0.5% as in (1) (compilers).
	Temp: precision probably at least ± 0.05 K as in (1) (compilers).
	1. Brunisholz, F.; Quinche, J.P.; Kalo, A.M. Helv. Chim. Acta <u>1964</u> , 47, 14.
	2. Flatt, R. Chimia <u>1952</u> , 6, 62.

COMPONENTS :	EVALUATOR:
(1) Gadolinium chloride; GdCl ₃ ; [10138-52-0]	Tomasz Mioduski
(2) Ethanol; C ₂ H ₆ O; [64-17-5]	Institute of Nuclear Research Warsaw, Poland

CRITICAL EVALUATION:

The solubility of GdCl₃ in ethanol has been reported only at 298.2 K in two publications (1,2), and both publication report an identical solubility of 2.43 mol kg⁻¹. However Kirmse reported the solid phase to be the monosolvate GdCl₃·C₂H₅OH whereas Merbach et al. reported GdCl₃·4C₂H₅OH as the equilibrated solid phase.

The initial salt used by Kirmse was anhydrous $GdCl_3$ prepared by the method of Taylor and Carter (3). Merbach et al. used $GdCl_3 \cdot 3C_2H_5OH$ as the initial solvate, and which was prepared by their transsolvation method. Since Merbach et al. confirmed the composition of the equilibrated solid phase as the tetrasolvate by ¹H NMR and X-ray diffraction, and since Kirmse does not report details on analysis of the solid phase, we conclude that the tetrasolvate is probably the stable solid phase at 298.2 K.

Merbach et al. state that their result is a mean of 2-4 determinations, and a precision of \pm 0.5 % was estimated by the compilers. Although Kirmse did not report any experimental details, her reported solubility is probably the mean of at least two determinations. In consideration of the agreement in solubility and the precision estimated by the compilers, the *tentative* solubility of GdCl₃ in ethanol at 298.2 K is 2.43 mol kg⁻¹ and the accuracy is estimated to be \pm 0.04 mol kg⁻¹. The stable solid phase at 298.2 K appears to be the tetrasolvate GdCl₃·4C₂H₅OH.

REFERENCES

1. Kirmse, E.M. Tr. II Vses. Konf. po Teor. Rastvorov 1971, 200.

(a) Merbach, A.; Pitteloud, M.N.; Jaccard, P. Helv. Chim. Acta <u>1972</u>, 55, 44.
 (b) Pitteloud, M.N. These. Faculte des Sciences de l'Universite de Lausanne. <u>1971</u>.

3. Taylor, M.D.; Carter, C.P. J. Inorg. Hucl. Chem. 1962, 24, 387.

COMPONENTS: (1) Gadolinium chloride; GdCl ₃ ; [10138-52-0]	ORIGINAL MEASUREMENTS: Merbach, A.; Pitteloud, M.N.; Jaccard, P. Helv. Chim. Acta <u>1972</u> , 55, 44-52.
(2) Ethanol; C ₂ H ₆ 0; [64-17-5]	Pitteloud, M.N. These. Faculte des Sciences de l'Universite de Lausanne. <u>1971</u> ,
VARIABLES:	PREPARED BY:
m/m	
1/K = 290.2	1. MIOGUSKI ANG M. SAIDMON
EXPERIMENTAL VALUES:	
	mean solubility ^a
× /2 a	
£7°C	moi kg
25	2.43
^a Initial salt was the adduct GdCl ₃ .3C ₂ H ₅ OH. yielded GdCl ₃ .4.1C ₂ H ₅ OH.	Analysis of the equilibrated solid phase
AUXILIARY	INFORMATION
Isothermal method as in (1,2). Mixtures were equilibrated for at least 4 days. Pro- longed operations were performed in a dry box. Gadolinium determined by titration with $(NH_4)_3H(EDTA)$ using a small amount of urotropine buffer and Xylenol Orange indica- tor. Chloride was determined by potentio- metric titration with AgNO ₃ solution. Com- position of the adduct GdCla.4CaHcO confirm-	Gd ₂ O ₃ of at least 99.9% purity dissolved in HCl to produce the hexahydrate. The adduct GdCl ₃ .3C ₂ H ₆ O prepared by dissolving the hydrate in a small excess of o-ethyl- formate followed by distillation and crystallization from ethanol. Ethanol (Fluka) was used as received. Purity and absence of water was confirmed
ed by ¹ H NMR and X-ray diffraction.	by NMR method.
The reported solubility is a means of 2-4 determinations.	ECTIMATED EDDOD.
	Soly: precision \pm 0.5% as in (1) (compilers).
	Temp: precision probably at least \pm 0.05K
	REFERENCES: 1. Brunisholz, F.; Quinche, J.P.; Kalo, A.M. Helv. Chim. Acta <u>1964</u> , 47, 14.
	2. Flatt, R. Chímia <u>1952</u> , 6, 62.

			0.0.7.07.1			
COMPONENTS:			ORIGINAL MEASUREMENTS: Kirmse, E.M.			
(1) Gadolinium chloride; GdCl ₃ ;		_	,			
[10138-52-0]			Tr. 1971	II Vses. K 200-6	onf. po leo	r. Kastvorov
(2) Alcohols				, 200 0.		
VARIABLES:			PREPAR	ED BY:	-	
т/к = 298			т. м	ioduski an	d M. Salomo	n
EXPERIMENTAL VALUES:			L			
						nature of the
solvent				mass %	more kg	solid phase
ethanol.	C.H.O:	[64-17-5	5]	39.0	2.43	GdC13.C2H60
ethanor,	-2-6-,					0.101 0.11-0
2-methoxyethanol;	с ₃ н ₈ 0 ₂ ;	[109-86-	-4]	4.0	0.16	Gacr3.nc3Hgu2
						(n = 2-3)
2-ethoxyethanol;	C ₄ H ₁₀ 0 ₂ ;	[110-80-	-5]	15.2	0.680	$GdC1_3.C_4H_{10}O_2$
2-propon-1-01.b	сно:	[107-18-	-61	30.0	1.63	$GdC1_2$, C_3H_60
2-propen-1-01,	360,	[+0	•1	••••		3 3 0
a _{Molalities} calculat	ed by the comp	ilers.				
Ъ				17	at the en	ther kindly
The source paper re	nt as allyl al	cohol.	n50n.	opon requ	est, the au	chor kindry
specified the second						
				<u> </u>		
		AUXILIARY	INFORM	ATION		
METHOD/APPARATUS/PROCI	EDURE :		SOURC	E AND PURI	TY OF MATER	IALS:
Experimental details	s not given, bu	t were	Noth	ing specif	ied, but ba	sed on previous
probably similar to	previous works	of the out this	prob	by the au ably prepa	red by the	method of Taylor
volume.	mpiled chilodeno		and	Carter (1)	•	
			ESTIM	ATED ERROR		
			Noth	ing specif	ied.	
			1			
			DEFET	ENCER		
			1. T	aylor, M.I).; Carter,	C.P.
			J 1	. Inorg. N	lucl. Chem.	<u>1962</u> , 24, 387.
1			1			

				<u></u>		- va-	
COMPONENTS: (1) Gadoli: [10138	nium chloride; -52-0]	GdCl ₃ ;		ORIGINAL Sakharov Ezhova,	MEASUREMENTS a, N.N.; Sakl T.A.; Izmaile	: narova, Yu.G.; ova, A.A.	
(2) Ethanol; C ₂ H ₆ 0; [64-17-5]		Zh. Inorg. Khim. <u>1975</u> , 20, 1479-83; Russ.					
(3) Water;	H ₂ 0; [7732-1	8-5]		830-2.		<u></u>	<u></u> ,,
VARIABLES:				PREPARED	BY:		
Temperature				T. Miodu	ski and M. S	alomon	
EVERAL	NALWES.						
EXPERIMENTAL	values:	G4C1 .6H 0 in	96.8	хснон	a		ie .
	somula 1	sample 2	samp	² 250	sample 4	mean solubi	lities
t/°C	e/100 e ^b	g/100 g	e/100) g	g/100 g	g/100 g	mol kg ^{-1c}
20	30.48	30.67	30.6	7	30.45	30.56	1.184
30	29,86	29.70	29.8	2	29.78	29.79	1.142
40	29.88	29.99	29.8	7	30.05	29.94	1.150
50	30.46	30.43	30.5	3	30.35	30.45	1.178
60	31.80	31.63	31.6	3	31.73	31.69	1.248
a _{rt} de set	alaanin atatad	whathan the mi		10.06.9		6 8 volume %	thanal
LE 15 NOC	clearly stated	whether the m	LALUI	2 15 90.0		0.0 VOIdile % e	chanor.
Solubiliti	es reported as	grams of hexab	nydrai	te in 100	g of solven	t.	
^C Molalities	calculated by	the compilers.	•				
		AUXIL	IARY	INFORMAT	ION		
METHOD/APPARATUS/PROCEDURE: Isothermal method used. Equilibrium was reached after 3-4 h. Identical results ob- tained by approaching equilibrium from above and below. Two of the data points in the table were obtained after 3 h of equilibration, and the remaining two data points were obtained after 4 h of equilibra- tion. The metal content in each aliquot taken for analysis was determined by complexometric titration with Trilon B. Analyses of the solids withdrawn at 20°C, 40°C and 60°C showed the solid phase to be the hexahydrate: i.e. ethanol was not found in any of the solid phases. The hexahydrate melted at 156.8 - 157.8°C.			SOURCE A GdCl3.6H oxide in crystn. cator ov analyzed B, and f Found (% 96.8% et c.p. gra followed refracto ESTIMATH Soly: re ± Temp: nc REFERENC	ND PURITY OF [20 prepd by a dil (1:3) H The crystal rer CaCl2, P2 i for the met for Cl by the () for Gd: 42 () for Cl: 28 chanol prepd ade 93.5% eth i by distn. ometrically a ED ERROR: esults appare 0.8% (compil othing specif	MATERIALS: dissolving c.f C1 followed by s were dried : 05 and NaOH. 7 al by titrn w Volhard metho .39, 42.30 (cz .69, 28.54 (cz by prolonged l anol with anhy Ethanol concn nd pycnometric ntly precise f ers).	b. grade y evapn and in a desic- Che crystals ith Trilon od. alcd 42.31). alcd 28.65). poiling of ydr CuSO4 determined cally. to within	
				ii			

COMPONENTS: (1) Gadolinium chloride; GdCl ₃ ; [10138-52-0]	ORIGINAL MEASUREMENTS: Merbach, A.; Pitteloud, M.N.; Jaccard, P. Helv. Chim. Acta <u>1972</u> , 55, 44-52.
(2) 2-Propanol; C ₃ H ₈ 0; [67-63-0]	Pitteloud, M.N. These. Faculte des Sciences de
	l'Universite de Lausanne. <u>1971</u> .
VARIABLES:	PREPARED BY:
T/K = 298.2	T. Mioduski and M. Salomon
EXPERIMENTAL VALUES:	
	mean solubility ^a
t/°C	mol kg ⁻¹
25	0.32
^a Initial salt was the adduct GdCl ₃ .3iso-PrO phase yielded GdCl ₃ .x-iso-PrOH where x = 3	H. Analysis of the equilibrated solid .0 - 3.1.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
were equilibrated for at least 4 days. Pro-	HCl to produce the hexahydrate. The ad-
box. Gadolinium determined by titration	the hydrate in a small excess of o-methyl-
with (NH ₄) ₃ H(EDTA) using a small amount of urotropine buffer and Xylenol Orange indica-	formate followed by distillation and trans-solvation of the methanol complex
metric titration with AgNO ₃ solution. Com-	The supervision of the second of the second se
ed by ¹ H NMR and X-ray diffraction.	Purity and absence of water was confirmed
The reported solubility is a mean of 2-4	by with.
determinations.	ESTIMATED ERROR: Soly: precision $\pm 0.5\%$ as in (1) (compilers).
	Temp: precision probably at least \pm 0.05K
	REFERENCES:
	Helv. Chim. Acta <u>1964</u> , 47, 14.
	2. Flatt, R. Chimia <u>1952</u> , 6, 62.

COMPONENTS :		ORIGINAL MEASUREMENTS:		
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>		McCarty, C.N.		
(2) 2-Methoxyethanol (methyl cellosolve); C ₃ H ₈ O ₂ ; [109-86-4]		Master of Science Thesis. University of Illinois. Urbana, IL, USA. <u>1933</u> 1.		
VARIABLES:		PREPARED BY:		
T/K = 273-323		M. Salomon and T. Mioduski		
EXPERIMENTAL VALUES:	<u> </u>			
	Composition of	f Saturated Solutions		
1	Gd203 ^a	GdCl ₃ ^b GdCl ₃ ^b		
t/°C	g/25 cc	g/dm ³ mol/dm ³		
0	0 6345	36.01 0.1/00	1	
	0.0345			
10	1.0/05	47.19 0.1790		
20	1.0495	0.2316	ļ	
30	1.1564	67.27 0.2552		
40	1.3202	76.80 0.2914	(
50	1.4464	84.15 0.3192		
The equilibrated solid phase not analyzed.				
	AUXILIARY	INFORMATION		
METHOD APPARATUS PROCEDURE:		SOURCE AND PURITY OF MATERIALS.		
METHOD/APPARATUS/PROCEDURE: Isothermal method. About 72 + excess salt were placed agitated in a thermostat for Ice + water was used for the ments. The bottles were fir glass stoppers and were see mosphere by placing gum rul the stoppers and necks of rubber stopper was fitted of the tubing. After equil: were allowed to settle for using a calibrated 25 cc pr were removed for analysis. evaporated to dryness and HCl and pptd as the oxalated acid. The samples were fill with dist water and ignited weight as the oxide. The be insoluble in the organid ESTIMATED ERROR: Soly: precision probably win (compilers). Temp: precision ± 0.2 K (an	5-100 cc of solvent in botttles and or at least 12 h. he 0°C measure- tted with ground aled from the at- bber tubing over the bottles. A into the upper end ibration, the slns at least 12 h, and ipet, two samples The samples were dissolved in aq e by addn of oxalic ltered, washed d to constant oxide was found to c solvent. ithin 3%	SOURCE AND PURITY OF MATERIALS: Commercial solvent was permitted to st over CaO for at least 1 week and then A middle portion (fraction not specifi was retained and stored in a stoppered b.p. 123°C. Gd salts prepd in 1925 as ammonium nitrates were of "spectroscop purity" and converted to the oxide, an anhydr chloride prepd by two methods. The oxide was dissolved in aq HC1 and excess HC1 evapd. The crystd salt was drated by heating in the presence of d first at 100°C for several h, then at 2. The rare earth benzoate was pptd f the aq chloride or nitrate with sodium ate, and the benzoate dehydrated by he to 110°C for at least 24 h. Extraction chloride was carried out with HC1 sadd and the resulting chloride heated at 6 first in a stream of dry HC1 and then air. The salt was stored in a desicca over P ₂ 0 ₅ . Dry HC1 was prepd from NaC H ₂ S04 followed by passage through H ₂ S0 drying towers. REFERENCES: 1. Hopkins, B.S.; Audrieth, L.F. Trans	and distd. ed) flask double ofc ud the 1. the dehy- rry HC1 200°C. rom benzo- eating of the ether, 0°C in dry tor 1 + 4	
		trochem. Soc. <u>1934</u> , 66, 135.		

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COMPONENTE		OPICINAL MEASUREMENT		
COMPONENTS:		URIGINAL MEASUREMENTS:		
(1) Gadolinium chloride; GdCl ₃ ;		McCarty, C.N.		
[10138-52-0]		Nastan of Science	Thosis	
(2) 2. Ethermotheral (athy	1 cellosolve	The University of	Tilinois Urbana II	
(2) 2-Echoxyeenanoi (echy	1 CEIIO301VE/,	USA, 19331	iiiinois. Orbana, ill,	
^{4¹10⁰2, ¹¹⁰⁻⁸⁰⁻⁵}		<u>1)))</u>		
VARIABLES:		PREPARED BY:		
T/K = 273 - 323		M. Salomon and T.	Mioduski	
EXPERIMENTAL VALUES:				
	Composition of Sat	urated Solutions		
	a. a. a.	a tar b	a tat b	
	^{Gd} 2 ⁰ 3	GaC13	Gac13	
. /80	-/25	- 11-3		
£/°C	g/25 cc	g/dm ⁻	mol/dm ³	
0	0 2202	12 20	0.050/	
10	0.2202	21 61	0.0904	
10	0.5714	21.01	0.1020	
20	0.0029	35.07	0.1331	
30	0.9456	55.01	0.2087	
40	1.1362	66.10	0.2507	
50	1.2442	12.38	0.2/46	
_				
^a Apparently these are avera	age values of at l	east two analyses fi	rom a given bottle.	
The author did not indicat	te whether there w	ere any differences	in results using	
GdCl ₃ from preparations 1	and 2.		-	
5				
h.				
Recalculated by the compil	lers using 1977 IU	PAC recommended atom	nic masses.	
The equi	librated colid pha	co not analyzed		
the equi-	ribraced solid pha	se not analyzed		
	AUXILIARY	INFORMATION		
MERIOD ADDADARUS (DROCEDURE)				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY O	F MATERIALS:	
isothermal method. About /:	D-100 CC OI SOL-	commercial solvent	was permitted to stand	
vent + excess sait were place	ced in bottles and	over Cau for at lea	ast 1 week and then dist.	
agitated in a thermostat for	r at least 12 h.	A middle portion ()	traction not specified)	
ice + water was used for the	e 0°C measurements	was retained and st	cored in a stoppered flask:	
The bottles were fitted with	n ground glass	b.p. 134°C. Gd salt	ts prepd in 1925 as double	
stoppers and were sealed fro	om the atmosphere	ammonium nitrates v	vere of "spectroscopic	
by placing gum rubber tubing	g over the stop-	purity" and convert	ted to the oxide, and the	
pers and necks of the bottle	es, and a rubber	annyar chloride pre	epd by two methods. 1.	
stopper was fitted into the	upper end of the	The oxide was disso	lved in ad HCI and the ex-	
tubing. After equilibration,	, the solutions	cess HCI evapd. If	he crystd salt was deny-	
were allowed to settle for a	at least 12 h, and	drated by heating i	In the presence of dry HCI	
using a calibrated 25 cc pip	pet, two samples	first at 100°C for	several n, then at 200°C.	
were removed for analysis.	ine samples were	2. Ine rare earth	benzoate was pptd from the	
evaporated to dryness and di	ssorved in ad HCT	ay chioride or nith	ale with socium benzoate,	
and pptd as the oxalate by addn of oxalic		and the penzoate de	24 h Eutrophics of the	
acid. Ine samples were ill	to constant	the c for at least	24 H. EXTRACTION OF THE	
with dist water and ignited	to constant	chioride was carrie	to out with HUL said etner,	
be incoluble in the encode.	colvent	and the resulting (and the Hell and then in June	
be insoluble in the organic	sorvent.	eir The self and	stored in a designator	
ESTIMATED ERROR:		air. ine sait Was	stored in a desiccator	
Solve precision probably with	thin 3%	Hoso, followed here	was prepu from Naor T	
(compilers)	-11211 3/0	druing tours	assage chrough nysoy	
(compilers).		urying cowers.		
Temp: precision \pm 0.2 K (aut	thor).	REFERENCES:		
		1. Hopkins, B.S.; A	udrieth, L.F. Trans. Elec-	
		trochem. Soc. <u>19</u>	34, 66, 135.	

COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Dzhuraev, Kh. Sh.; Mirsaidov, U.; Kurbanbekov, A.; Rakhimova, A.
(2) Diethyl ether (ethyl ether); C ₄ H ₁₀ 0; [60-29-7]	Dokl. Akad. Nauk Tadzh. SSR <u>1976</u> , 19, 32-4.
VARIABLES:	PREPARED BY:
T/K = 293	T. Mioduski
EXPERIMENTAL VALUES:	
The solubility of GdCl ₃ in diethyl ether at	20°C was reported to be
0.028	mass %
The corresponding molality calculated by the	compiler is
1.06 x	$10^{-3} \text{ mol kg}^{-1}$
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE: Isothermal method employed. Equilibrium was attained within 24 h and it was verified by constancy in the Gd concentration. The sat- urated solution and the equilibrated solid	SOURCE AND PURITY OF MATERIALS: Anhydrous GdCl ₃ prepared by the ethanol solvate method (no details given). Ethyl ether was dried with Na and distilled from LiAlH ₄ before use.
phase were analyzed. Gd determined by com- plexometric titration in presence of uro- tropine buffer and methyl-thymol blue indi- cator. Chloride determined by titration with AgNO ₃ . The solid phase corresponded to GdCl ₃ .0.5Et ₂ O (the etherate was dried under vacuum at 40°C prior to analysis).	
	ESTIMATED ERROR:
	Nothing specified.
	REFERENCES:

COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Kirmse, E.M.; Zwietasch, K.J. Z. Chem. 1967, 7, 281.
(2) 1,2-Diethyoxyethane; C ₆ H ₁₄ O ₂ ; [629-14-1]	
VARIABLES:	PREPARED BY:
T/K = 298	T. Mioduski

EXPERIMENTAL VALUES:

The solubility of $GdCl_3$ in 1,2-diethoxyethane at 25°C was reported to be

0.33 mass %

The corresponding molality calculated by the compiler is

0.0126 mol kg⁻¹

The composition of the solid phase was given in terms of the Gd:Cl:ether ratio as

1:2.91:0.99

AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
Isothermal method used. The anhydrous ^m ixtures were equilibrated at 25°C for several days with frequent shaking.	Sources and purities of materials not given. The anhydrous chloride was obtained by the method of Taylor and Carter (1).		
The solid phase was dried in a vacuum desiccator over P_2O_5 .	The solvent was prepared by the Williamson synthesis: i.e. by reaction of C_{2H_5I} with the monoethylether of ethylene glycol.		
Gd was determined by complexometric titra- tion using Xylenol Orange indicator. Chloride was determined by the Volhard titration method.			
	ESTIMATED ERROR:		
	No estimate possible.		
	REFERENCES:		
	1. Taylor, M.D.; Carter, C.P. J. Inorg. Nucl. Chem. <u>1962</u> , 24, 387.		
	. -		

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230	Gauonnu	in chionae		
COMPONENTS:		ORIGINAL MEAS	UREMENTS :	
<pre>(1) Gadolinium chloride; GdC [10138-52-0]</pre>	:13;	Kirmse, E.M.; Zwietasch, K.J.; Tirschman J.; Oelsner, L.; Niedergesaess, U. Z. Chem. <u>1968</u> , <i>8</i> , 472-3.		
(2) Ethers		Kirmse, E.M. Tr. II Vses. Konf. po Teor. Rastvorov. <u>1971</u> , 200-6.		
VARIABLES:		PREPARED BY:		
Room Temperature: T/K around	298	T. Mioduski a	and M. Salomo	n
EXPERIMENTAL VALUES:				
				_
			GdCl ₃ solu	bility ^{a,b}
solvent			mass %	mol kg ⁻¹
1-ethoxy-2-methoxyethane;	с _{5^н12⁰2;}	[5137-45-1]	0.55	0.021
1-methoxypentane;	с ₆ н ₁₄ 0;	[628-80-8]	0.08	0.0030
1,4-dioxane;	C,H_0;	[123-91-1]	0.1	0.0038
	48			
^a Molalities calculated by the	compilers.			
h				
Nature of solid phases not s	pecified.			
	·			
	AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PU	RITY OF MATE	RIALS:
The solute-solvent mixtures w	ere isother-	The anhydrou method of Ta	s salt was p vlor and Car	repared by the
ture. Authors state that the	difference			
mental error limits.	within experi-	No other inf	ormation giv	en.
Gd was determined by complexor tion.	metric titra-			
No other details given.				
		1		
		ESTIMATED ER	ROR:	
]		Nothing spec	ified.	
		REFERENCES :		
		1. Taylor, M.	D.; Carter, (C.P.
		J. Inorg.	Nucl. Chem.	<u>1962</u> , 24, 387.
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COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Rossmanith, K.; Auer-Welsbach, C.
(2) Tetrahydrofuran; C ₄ H ₈ 0; [109-99-9]	
VARIABLES:	PREPARED BY:
Room Temperature: T/K about 293	T. Mioduski
EXPERIMENTAL VALUES:	

The solubility of GdCl₃ in tetrahydrofuran at 20°C (room temperature) was reported to be

1.91 g per 100 ml of solution

 $(0.0725 \text{ mol } dm^{-3}, \text{ compiler}).$

AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: Isothermal method employed. The solution was equilibrated in an extractor with agita- tion for 60-80 hours at room temperature. Gadolinium was determined by the oxalate method, and by titration with EDTA using Xylenol Orange indicator. The solvent was determined by difference. Anhydrous materials were handled in a dry box through which was passed a stream of nitrogen free of carbon dioxide. The solid phase is GdCl ₃ .2.07C ₄ H ₈ 0.	SOURCE AND PURITY OF MATERIALS: Sources and purities of initial materials not specified. GdCl ₃ was prepared by conversion of the oxide by high temperature reaction with an excess of NH ₄ Cl followed by heating the product in a stream of dry nitrogen, and then in vacuum to remove unreacted NH ₄ Cl. Tetrahydrofuran was distilled from LiAlH ₄ . ESTIMATED ERROR: Nothing specified.			
	REFERENCES :			

COMPONENTS:	ORIGINAL MEASUREMENTS .		
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Korovin. S.S.; Galaktionova, O.V.; Lebedeva, E.N.; Voronskaya, G.N.		
(2) Tributylphosphate; C ₁₂ H ₂₇ O ₄ P; [126-73-8]	Zh. Neorg. Khim. <u>1975</u> , 20, 908-14; Russ. J. Inorg. Chem. (Engl. Transl.) <u>1975</u> , 20, 508-11.		
VARIABLES:	PREPARED BY:		
T/K = 298	T. Mioduski and M. Salomon		
EXPERIMENTAL VALUES:	J		
Composition of saturated solution			
mass % mol/kg sln g dm ⁻³	mol dm ⁻³ mol kg ⁻¹ density/g cm ³ (compiler)		
37.8 1.44 494.0	1.88 2.31 1.33		
The solid phase is GdCl ₃ .			
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: Saturated solutions prepared isothermally with magnetic stirring. Equilibrium was attained after 25-30 d. The solution was centrifuged and an aliquot for analysis taken and added to methanol and pptd with aq NH ₃ . The pptd Gd(OH) ₃ was washed repeated- ly and heated to the oxide for gravimetric analysis. The solid phase was analyzed (no details given) for phosphorous and only anhydrous GdCl ₃ was found. All operations were performed in a dry box through which a stream of argon was passed. The major objective of this work was to	SOURCE AND PURITY OF MATERIALS: Anhydrous GdCl ₃ prepared by chlorination of Gd ₂ O ₃ with CCl ₄ vapor (1,2). Source and purity of materials not given. Gd was analyzed gravimetrically and Cl by Volhard's method. Tributylphosphate (TBP) was puri- fied "by the standard method." No addition- al details given.		
establish the nature of complexation be- tween TBP and GdCl ₃ in solution. Additional IR spectra studies with unsaturated solu- tions are discussed in the source paper.	No estimates possible. REFERENCES: 1. Korshunov, B.G.; Drobot, D.V.; Bukhtiyarov, V.V.; Shevtsova, Z.N. Zh. Neorg. Khim. <u>1964</u> , 9, 1427. 2. Novikov, G.I.; Tolmacheva, V.D.		
	Zh. Prikl. Khim. <u>1965</u> , 38, 1160.		

Gadolinium Chloride 259					
COMPONENTS: (1) Gadolinium chloride; GdCl ₃ ; [10138-52-0]		ORIGINAL MEASUREMENTS: Kirmse, E.M.		S:	
(2) Alkyl amines			17. 1. <u>1971</u> ,	1 Vses. Konf. 200-6.	ρο Γεοτ. Καστυοτου
VARIABLES:			PREPARED BY:		
T/K = 298			T. Mioduski and M. Salomon		
EXPERIMENTAL VALUES:					
				GdCl ₃ so	lubility ^a
solvent				mass %	mol kg ⁻¹
1-propanamine;	с ₃ н ₉ N;	[107-10	-8]	32.4	1.82
2-propanamine;	iso-C ₃ H ₉ N;	[75-31-	0]	21.0	1.01
2-propen-1-amine; ^b	^C 3 ^H 7 ^N ;	[107-11	-9]	14.6	0.649
1-butanamine;	$n-C_{4}H_{11}N;$	[109-73	-9]	23.0	1.13
2-butanamine;	<pre>sec-C4H11N;</pre>	[13952-	84-6]	18.7	0.873
^a Molalities calculat ^b The original paper author kindly ident	ed by the compi simply specifie ified the solve	lers. s the sol nt as all	vent as ylamine	C _{3^H5^{NH}2, and}	upon request, the
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE	AND PURITY OF	MATERIALS:
Experimental details not given, but were probably similar to previous works of the author which are compiled throughout this volume. Nature of solid phases not specified.			Nothing specified, but based on previous work by the author the anhydrous salt was probably prepared by the method of Taylor and Carter (1).		
			ESTIMA	TED ERROR:	
			Nothi	ng specified.	

REFERENCES:

 Taylor, M.D.; Carter, C.P. J. Inorg. Nucl. Chem. <u>1962</u>, 24, 387.

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COMPONENTS :	ORIGINAL MEASUREMENTS:			
<pre>(1) Gadolinium chloride; GdCl₃; [10138-52-0]</pre>	Mikheev, N.B.; Kamenskaya, A.N.; Konovalova, N.A.; Zhilina, T.A.			
(2) Hexamethylphosphorotriamide; C ₆ H ₁₈ N ₃ OP; [680-31-9]	Zh. Neorg. Khim. <u>1977</u> , 22, 1761-6; Russ. J. Inorg. Chem. (Engl. Transl.) <u>1977</u> , 22, 955-8.			
VARIABLES:	PREPARED BY:			
Room temperature: $T/K = 298 \pm 3$	T. Mioduski			
EXPERIMENTAL VALUES:				
Starting with the solvate $GdCl_3.3((CH_3)_2N)_3PO$, the solubility at 25 \pm 3°C ^a was given as 0.125 \pm 0.002 mol dm ⁻³				
^a Table 3 in the English translation of the source paper states the temperature to be $23 \pm 3^{\circ}$ C. This is probably a typographical error as the text clearly states that all measurements were carried out at room temperature (25 ± 3°C).				
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE: Isothermal method used. Salt and solvent were placed in a test-tube in a dry box, and the tube agitated at room temperature $(25 \pm$ 3°C) until equilibrium was reached. Aliquots were withdrawn periodically and analyzed for the metal content. Rare earth concentration was determined by complexometric titration, and by the radiometric method using the isotope Tm-170 (t ₁ = 169 d). Authors state that results for both methods agreed. Although not clearly stated, it appears that equilibrium was reached in several weeks to	SOURCE AND PURITY OF MATERIALS: $GdC1_3.3C_6H_{18}N_3OP$ prepd by dissolving the hydrate in $C_3H_{18}N_3OP$ and heating to 140-150° C for 5 m. The solvate was pptd by addi- tion of abs ether, washed 7 times with ether, and dried over P_2O_5 in a stream of dry nitrogen. Yield was about 90%. The solvent was purified as described in (1).			
several months. Solid phase samples washed three times with benzene or ether and dried on a steam bath in an argon atmosphere. The solid phase was analyzed and found to be GdCl ₃ .3C ₆ H ₁₈ N ₃ OP.	ESTIMATED ERROR: Soly: precision \pm 0.002 mol dm ⁻³ at a 95% level of confidence (authors). Temp: precision \pm 3K.			
The solvate was analyzed for metal content by complexometric titrn, for chloride by the Volhard method, and the solvent was obtained by difference. IR spectra confirmed the absence of water. Structural studies of the solvate also carried out by X-ray analysis.	REFERENCES: 1. Fomicheva, M.G.; Kessler, Yu.M.; Zabusova, S.E.; Alpatova, N.M. Elektrokhimiya <u>1975</u> , 11, 163.			

COMPONENTS		OPTOTNAL MEASUDEMENTS.	
(1) Gadolinium chloride; GdCl	3;	UNIGINAL MEASUREMENTS:	
[10138-52-0]			
<pre>(2) Tetrachlorostannate; SnCl₄; [7646-78-8]</pre>		2n. Prana. Knam. <u>1972</u> , 45, 1176–8.	
(3) Phosphorus oxychloride; P [10025-87-3]	'0C1 ₃ ;		
VARIABLES:		PREPARED BY:	
T/K = 293		T. Mioduski	
Concentration of SnCl4			
EXPERIMENTAL VALUES:		· · · · · · · · · · · · · · · · · · ·	
SnCl ₄ POCl ₃ ratio	SnCl ₄ concentr	ation Gd ₂ O ₃ solubility ^{a, D}	
(by volume)	mol dm^{-3}	moles Gd dm^{-3}	
0	0	0.015	
1:250	0.035	0.11	
1:100	0.085	0.27	
1:50	0.17	0.29 (0.16)	
1:25	0.33	0.079	
1:15	0.59	0.042	
1:10	0.78	0.11	
^a Solutions preheated to 220°C.	. Value in pare	enthesis corresponds to preheating at 120°C.	
^b This is also the solubility of quantitatively converted to the solubility of the	of GdCl ₃ in the the chloride acc	SnCl ₄ -POCl ₃ mixture because the oxide is cording to	
$Gd_2O_3 + 6POCl_3 = 2GdCl_3 + 3P_2O_3Cl_4$			
		the considered to be a four component	
Thus the equilibrated solutions should actually be considered to be a four component system containing SnCl4, GdCl3, P203Cl4 and POCl3 (the compiler assumes P203Cl4 is soluble).			
Authors state that the solubility of GdCl3 is enhanced by complex formation according to			
2Ga0	Cl ₃ + 3SnCl ₄	$= \operatorname{Gd}_2(\operatorname{SnCl}_6)_3$	
AUXILIARY INFORMATION			
METHOD APPARATUS PROCEDURE .		SOURCE AND PURITY OF MATERIALS.	
Isothermal method used. POC1 solutions were prepared by vo	3 + SnCl4 lume in a dry	Gd_2O_3 of "the first sort" was ignited at 950°C for 2 hours.	
box. The SnCl ₄ content was ve	erified by is solution and	"Pure" grade SnCl, and POCl, were dehy-	
Gd202 were placed in sealed a	mpoules,	drated with P205 and distilled under	
heated to 20-250°C to increase	e the rate of	vacuum.	
solution, and then rotated in	an air ther-		
mostat at 20°C for 2-200 hour	s. Without		
preheating, equilibrium was e	stablished		
after 200 hours. Preheating	to 120°C		
lowered the equilibration tim	e at 20°C to		
2 hours.			
Gd was determined by colorime	tric analysis.	ESTIMATED ERROR: Solv: authors state the "coefficient of	
and in some cases by the oxal	ate method.	variance" to be less than 7%.	
The reported solubilities are	mean values	Towns provision programshiv $\pm 0.2K$	
based on 3-5 parallel determinations.		(compiler).	
1		REFERENCES :	
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