

NOVIKOV, G.I.

SOV 84-00000000

5(3)

AUTHORS:

Shchekarev, S. A., Novikov, G. I. Andrejeva, N. V.

TITLE:

Thermodynamic Investigation of Lower Tungsten Chlorides
(Termodynamicheskoye issledovanie nizshikh khloridov volframa)

PERIODICAL:

Vestnik Leningradskogo universiteta Seriya fiziko-khimicheskaya
1959, Nr 1, pp 120-131 (USSR)

ABSTRACT:

For these investigations compounds WCl_5 and WCl_4 were used, which were obtained from WCl_6 by reduction with hydrogen. WCl_3 was obtained from the decomposition of WCl_5 in vacuum at 450°C (Refs 1,4). The three tungsten chlorides were analyzed by their hydrolysis, a method that had been worked out by the authors in their work as per reference 1. The vapor pressure of WCl_4 was determined in the temperature range of 450-600°C. The values for the saturated and unsaturated vapor pressures are given in table 1. From the latter the molecular weight of WCl_4 in the vapor phase was determined by the aid of the Mendeleev-Klapeyron equation. In this case the true molecular weight of the

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Thermodynamic Investigation of Lower Tungsten Chlorides

was detected in the vapor and the thermodynamic characteristics of dipolymerization, proceeding according to the scheme $(W_2Cl_{10})_{\text{vapor}} = 2(WCl_5)_{\text{vapor}}$, were calculated. The total pressure and the optical density of WCl_2 in the temperature range of 150-500° were measured (the corresponding results in table 1). These measurements led to the assumption that tungsten pentachloride is disproportionated according to the scheme $3(WCl_5)_{\text{vapor}} = (WCl_4)_{\text{vapor}} + (WCl_6)_{\text{vapor}}$. For this process the thermodynamic characteristics were determined by approximation. From the pressure of the saturated vapor of WCl_2 and the thermodynamic characteristics of sublimation and of evaporation were determined together with the melting and boiling points. It was further found that WCl_4 is likewise disproportionated and its proportionation pressure having been measured in the temperature range of from 400 to 600°. Disproportionation according to the scheme $3 WCl_4 \text{ solid} = WCl_2 \text{ solid} + 2(WCl_3)_{\text{vapor}}$.

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Thermodynamic Investigation of Lower Tinwater Chlorides

evaporating simultaneously. From the data obtained from the pressure measurements the thermodynamic characteristics were determined for this disproportionation process as well. The disproportionation pressure for the solid WCl_2 was measured in the temperature range of from 490 to 580° (Table 14). There are 15 tables and 15 references, 10 of which are Soviet.

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5 (4)

AUTHORS:

Shchukarev, S. A., Novikov, G. I., ~~Levina~~ SOV/54-59-2-11/24
Andreyeva, N. V.

TITLE:

Dependence of the Disproportionation Pressure of Low Tungsten Chlorides on the Composition of the Solid Phase
(Zavisimost' uprugosti disproporsionirovaniya nizshikh khloridov vol'frama ot sostava tverдой fazy)

PERIODICAL:

Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1959, Nr 2, pp 79-82 (USSR)

ABSTRACT:

The thermodynamic characteristic of the disproportionation of WCl_4 and WCl_2 to the final products WCl_6 and metallic W respectively, is only possible if in the existing solid phase no interaction of these substances occurs. In this connection, investigations of the dependence mentioned in the title were carried out here. WCl_6 was used as initial product for the preparation of the low tungsten chlorides. WCl_4 was obtained by repeated reduction (Refs. 1-3) in the absence of a current, and WCl_2 by disproportionation of the latter. The initial

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Dependence of the Disproportionation Pressure of WCl_5 on the Composition of the Solid Phase
Low Tungsten Chlorides

mixture used for the investigation, which contained WCl_5 , WCl_4 and WCl_2 and also metallic W, was analyzed by pyrolysis (Ref 6). The results are indicated in table 1. The steam pressure over the mixture was statically determined by quartz-diaphragm zero manometer (see Refs 7, 8). The total pressure of the steam over a $WCl_5 + WCl_4$ mixture with different ratios Cl:W at different temperatures (Table 2) shows that the isothermal line of the steam pressure at the interval 4.6-4.0 Cl:W assumes the values of the isothermal line of the disproportionation pressure of the pure WCl_4 . This statement shows that there is a certain limited solubility between WCl_5 and WCl_4 . The insolubility of the mentioned substances in one another is determined by the pressure of the disproportionated steam over the $WCl_4 + WCl_2$ mixture at various ratios Cl:W (Table 3) which shows perfectly horizontal isothermal lines. Table 4 shows the disproportionation

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Dependence of the Disproportionation Pressure of WCl_2 + metallic W. SOV/54-59-2-11/24
Low Tungsten Chlorides on the Composition of the Solid Phase

pressures of the steam over a mixture of WCl_2 + metallic W.
It shows that there is a certain interaction between the mentioned substances. A comparative X-ray investigation showed that WCl_2 exists in the range 2.0-1.7, and some unknown lines can be observed beside the lines of the latter; in the range 1-0, there are only the lines of pure metallic tungsten beside some unknown lines. Therefore, the determination of the disproportionation scheme of the mixture WCl_2 is rendered very difficult by the existence of a solubility of WCl_2 and W in one another. There are 4 tables and 8 references, 3 of which are Soviet.

SUBMITTED: June 1, 1958

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SOV/78-4-9-22/44

5(2)
AUTHORS: Shchukarev, S. A., Novikov, G. I., Suvorov, A. V., Maksimov, V. K.

TITLE: The Thermographical Investigation of the Systems $WCl_6 - WO_3$,
 $WCl_6 - WO_2$, $WCl_6 - MoCl_5$

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 9, pp 2062-2066
(USSR)

ABSTRACT: Tungsten oxychlorides are only occasionally described in publications. However, as tungsten forms a considerable number of oxides and chlorides, a corresponding number of oxychlorides may be expected. The equipment used in the investigation is schematically drawn in figure 1. One of the thermograms drawn by means of two M-21 reflecting galvanometers is given in figure 2 as an example. A scheme of the electric furnace is shown in figure 3. Figure 4 represents the melting-point diagram of the system $WCl_6 - WO_3$. From this it is evident that two oxychlorides are formed in the system $WOCl_4$ and WO_2Cl_2 . From the melting-point diagram of the system $WCl_6 - WO_2$ (Fig 5) three hitherto unknown oxychlorides were deduced:

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The Thermographical Investigation of the Systems
 $WCl_6 - WO_3$, $WCl_6 - WO_2$, $WCl_6 - MoCl_5$

SOV/78-4-9-22/44

$3WCl_6 \cdot WO_2$, $WCl_6 \cdot WO_2$ (or $WOCl_3$), and $WCl_6 \cdot 3WO_2$. A simple eutectic and regions of partial solubility in the solid phase were ascertained in the melting-point diagram of the system $WCl_6 - MoCl_5$ (Fig 6). There are 6 figures and 5 references, 1 of which is Soviet.

SUBMITTED: June 16, 1958

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507/78-4-10-1/40

5(2)
AUTHORS:Shchukarev, S. A., Novikov, G. I., Kokovin, G. A.

TITLE:

Determination of Saturation Vapor Pressure and Molecular Weight of Tungsten Pentabromide

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 10, pp 2185-2188 (USSR)

ABSTRACT:

There are only a few data available in publications on the bromine compounds of tungsten presently known (WBr_6 , WBr_5 , WBr_2 , $WOBr_4$, WO_2Br_2). For this reason the authors report on tensimetric and thermographic determinations carried out on WBr_5 . $W(CO)_6$ and Br_2 were used as initial products, which react under formation of hexabromide which was decomposed in vacuo at 250° to give WBr_5 and Br_2 . The tensimetric determination was carried out by means of a diaphragm-zero-manometer made of heat-resistant glass of the P-15 type. The temperature was measured by means of the PPTV-1 potentiometer. Table 1 gives the values obtained for the vapor pressure of WBr_5 between 170.4 and $384.4^\circ C$ and 1 - 655 torr. In figure 1 the curve

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Determination of Saturation Vapor Pressure and Molecular Weight of Tungsten Pentabromide

$\log P_{\text{saturated}} = f\left(\frac{1000}{T^{\circ}\text{K}}\right)$ is shown. Between 230° and the melting point 295°C the values are below the calculated curve owing to impurities. The computed values for the vaporization and sublimation enthalpy and -entropy are in good agreement with the values obtained by L. Brewer (Ref 1), whereas the resultant melting- and boiling points deviate from the data available in publications. According to table 3 the analysis of WBr_5 gives a bromine content somewhat higher than that corresponding with the formula which is due to bromine adsorption. The values computed at 678.2°K and 742.2°K for the molecular weight of WBr_5 are likewise above the theoretical value. The presence of polymerized molecules is assumed. The solidification temperature obtained by tensimetry deviates a little from the value determined thermometrically (Table 5). There are 1 figure, 5 tables, and 6 references, 2 of which are Soviet.

SUBMITTED: June 1, 1957

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SHCHUKAREV, S.A.; NOVIKOV, G.I.; ANDREYEVA, N.V.

Thermodynamic investigation of the lower tungsten chlorides.
Vest.LGU 14 no.4:120-131 '59. (MIRA 12:5)
(Tungsten chlorides)

SHCHUKAREV, S.A.; NOVIKOV, G.I.; ANDREYEVA, N.V.

Effect of the composition of the solid phase on the disproportiona-
tion pressure of lower tungsten chlorides. Vest. LGU 14 no.10:
78-82 '59. (MIRA 12:6)

(Tungsten chlorides)

24 (7). 5 (4)

AUTHORS:

Suvorov, A. V., Shchukarev, S. A.,
Novikov, G. I.

SOV/48-23-10-30/39

TITLE:

On the Possibility of a Molecular Spectral Analysis of Vapors
Within a Wide Temperature Range

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959,
Vol 23, Nr 10, pp 1248-1250 (USSR)

ABSTRACT:

For the analysis of gas- and vapor mixtures it is possible to use the spectrum of this mixture in the visible-, in the ultraviolet-, or in the infrared range; whereas in the ultraviolet range the quantum energies are already so high that un-called for photochemical reactions occur, the strong influence exercised by temperature in the infrared range is a disturbing factor. For the investigation of a complex system in equilibrium, a spectroscopic method is, in any case, insufficient, because it is necessary, besides the partial component pressures, to know also the total pressure in the system. For their determination it is possible to employ any statistical method, but the membrane method (with zero manometer) was found to be especially useful. It was found that the amount of absorption is influenced by pressure, and

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On the Possibility of a Molecular Spectral Analysis of Iodine Vapors within a Wide Temperature Range SOV/48-23-10-30/39

still more by temperature. The temperature dependence of the amount of absorption has hitherto not been quantitatively investigated. Such an empirical method was the aim to be fulfilled by the authors. An investigation of the temperature-dependent variation of absorption and optical density in iodine vapors resulted in the formula $K_{\nu} = \chi_{\nu} T$, where χ_{ν} is a quantity which is independent of temperature. For its verification the system $N_2O_4 - NO_2 - NO - O_2$ was investigated in the range 18-480°C. Figure 5 shows the measured temperature dependence of the pressure p and of the optical density D . The diagram may be divided into 3 ranges: I) 18-100°, equilibrium $N_2O_4 = 2NO_2$, II) 100-200°, pure NO_2 , III) 200-480°, equilibrium $2NO_2 = 2NO + O_2$. By using the Lambert-Beer law a formula may be derived for the determination of χ_{ν} : $\chi_{\nu} = (D_{\nu}/p)(R/d)$. For a given frequency the following is thus obtained:

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On the Possibility of a Molecular Spectral Analysis of Vapors Within a Wide Temperature Range SOV/48-23-10-30/39

$x_{5575} = 0.0194 \pm 0.0002$. Similar investigations were carried out of a number of gas mixtures: $\text{WCl}_6 - \text{WCl}_5 - \text{Cl}_2$; $\text{WOCl}_4 - \text{WO}_2\text{Cl}_2 - \text{WCl}_6 - \text{Cl}_2$ and $\text{WO}_2\text{Cl}_2 - \text{WO}_3 - \text{WOCl}_4 - \text{WCl}_6 - \text{Cl}_2$. For the system $\text{WOCl}_4 - \text{WCl}_6 - \text{WO}_2\text{Cl}_2$ the temperature dependence of p and D is also shown by a diagram in figure 4. There are 4 figures and 1 Soviet reference.

ASSOCIATION:

Khimicheskiy fakul'tet Leningradskogo gos. universiteta im. A. A. Zhdanova (Chemical Department of Leningrad State University imeni A. A. Zhdanov)

Card 3/3

28 (5)

AUTHORS:

Novikov, G. I., Suvorov, A. V.

SOV/32-25-6-40/53

TITLE:

Membrane Zero Pressure Gauge for the Measurement of Vapor Pressure in a Broad Temperature Interval (Membrannyi nul'manometr dlya izmereniya davleniya parov v shirokom intervale temperatur)

PERIODICAL:

Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 750-751 (USSR)

ABSTRACT:

Several years ago a production technique was worked out of membranes for zero pressure gauges without the shortcomings of the pressure gauges according to reference 2 (Ref 1). As the membrane chamber is also in the present case not quite small enough, a device with smaller dimensions and a flat membrane was constructed. The pressure gauge may be made of molybdenum- or pyrex glass as well as of quartz (figure 1, scheme of the pressure gauge). The glass membrane is made from a glass ball which is blown and then flattened (Fig 2). A rodlet is melted on to the surface the shift of which in connection with a motion of the membrane indicates a change in pressure on an opposed needle. The sensitivity of measurements depends on the quality of the membrane, the thickness of the rodlet and the deviation of the top of the

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Membrane Zero Pressure Gauge for the Measurement of Vapor Pressure in a Broad Temperature Interval SOV/32-25-6-40/53

rodlet from the needle. The high accuracy of measurement of the device was confirmed in determining the vapor pressures of sulfur, mercury, iodine, nitrogen oxides (Ref 3) etc. There are 2 figures and 5 Soviet references

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

Card 2/2

28(5)
AUTHORS: Novikov, G. I., Suvorov, A. V., Bayev, A. K. SOV/32-25-9-27/53

TITLE: Method of Determining the Pressure of the Saturated Vapor of Difficultly Volatile Substances

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 9, pp 1097-1099 (USSR)

ABSTRACT: A method was developed by which the sample is vaporized in an inert gas in a closed vessel, the inert gas acting as an elastic medium which transfers the vapor pressure to a pressure gauge outside the high-temperature range. From the scheme of the gauge (Fig 2) it may be seen that the substance to be investigated evaporates in a cylindrical quartz vessel which is housed in a furnace and is connected to a diaphragm zero-pressure gauge by means of a tube. The latter is contained in a thermostat and transmits the pressure to the pressure gauge which permits measurements with an accuracy of ± 0.5 torr. From the measurement results obtained on the apparatus described the pressure of the saturated vapor of KCl was computed, and a curve of the dependence of the vapor pressure on temperature was plotted (Fig 3). Comparison with the corresponding values in Stell's table shows good agreement of the data. There are 3 figures.

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Method of Determining the Pressure of the Saturated Vapor of Difficultly
Volatile Substances

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova
(Leningrad State University imeni A. A. Zhdanov)

Card 2/2

NOVIKOV, G.I.; MAKARENIA, A.A.; RYABOV, A.N.; SUVOROV, A.V.

Improved circulation method of determining the dissociation pressure. Izv. vys. ucheb. zav; khim. i khim. tekhn. 3 no. 5:952-958 '60. (MIRA 13:12)

1. Leningradskiy gosudarstvennyy universitet. Kafedra obshchey i neorganicheskoy khimii.
(Gases--Analysis)

Received

S/078/60/005/008/002/018
B004/B052

AUTHORS: Shchukarev, S. A., Novikov, G. I., Vasil'kova, I. V.,
Suvorov, A. V., Andreyeva, N. V., Sharupin, B. N.,
Bayev, A. K.

TITLE: The Thermodynamic Properties of Chlorides and Oxchlorides
of Tungsten and Molybdenum

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 8,
pp. 1650-1654

TEXT: By applying various methods, the authors wanted to check the formation heats, formation entropies, and formation enthalpies in the case of Mo- and W chlorides, published in western papers (Refs. 1, 2). They investigated: WCl_6 , $MoCl_5$, $WOCl_4$, $MoCl_4$, WO_2Cl_2 (obtained by a successive chlorination of WO_3 and MoO_3 by means of CCl_4); MoO_2Cl_2 (obtained by the reaction between MoO_2 and Cl_2); $MoCl_3$, WCl_4 , WCl_5 (by the reduction of $MoCl_5$ and WCl_6 by means of H_2); and $MoCl_2$, WCl_2 (obtained by disproportionation). ✓

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The Thermodynamic Properties of Chlorides
and Oxychlorides of Tungsten and Molybdenum

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tion of MoCl_3 , and WCl_4 , and MoOCl_4). Two calorimetric methods were applied:

1) Comparison of the heat of solution of the investigated substance to the heat of solution of a substance whose heat of formation is known (Table 1).
2) Combustion in oxygen (Table 2). Furthermore, the vaporization, depolymerization, dissociation, and disproportionation processes taking place in a state of equilibrium, were spectrophotometrically and tensimetrically investigated (Tables 3, 4). The enthalpies of formation, and partly also the standard entropies of formation were calculated from the experimental data. In Tables 5 (Mo compounds) and 6 (W compounds) they are compared with the data given in Ref. 2 which were adopted almost unchanged by the US National Bureau of Standards (Ref. 9). The values determined by the authors are 1.4 - 1.7 times as high. Therefore, the dependence of the free energy of formation of temperature is different altogether. This is graphically represented in Fig. 1 (comparison of determined ΔH° and ΔF° for tungsten compounds, with the data of the National Bureau of Standards) and Fig. 2 (comparison of the ΔH_{form} of Cr, Mo, and W chlorides, with the data of the National Bureau of Standards). There are 2 figures, 6 tables, and 9 references: 6 Soviet, 2 US, and 1 Dutch.

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The Thermodynamic Properties of Chlorides
and Oxychlorides of Tungsten and Molybdenum

S/078/60/005/008/002/018
B004/B052

ASSOCIATION: Leningradskiy gosudarstvennyy universitet Khimicheskiy
fakul'tet
(Leningrad State University Department of Chemistry)



SUBMITTED: May 6, 1959

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S/078/61/006/004/010/018
B127/B220

AUTHORS: Novikov, G. I., Polyachenk, O. G.

TITLE: Thermographic method of measuring the pressure of saturated vapors of difficultly volatile compounds

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 8, 1961. 1951-1952

TEXT: The authors used the "boiling point" method which has the advantages of the method by L. G. Berg (Ref. 2: IZV, Sektory fiz.-khim. analiza, 22, 140 (1953)). This method makes it possible to determine the moment when the vapor pressure of the substances equals the pressure outside the reaction vessel. In the present case, this moment was determined from the temperature drop of the substances, which occurred with their increasing evaporation near boiling point. The apparatus required is shown in Fig. 1. When experimenting with hygroscopic and easily oxidizable substances, the reaction vessel is connected to a vacuum apparatus and filled with pure and dry nitrogen. The current from the differential thermocouple is measured by a mirror galvanometer of 10^{-9} a/mm·m sensitivity. Gradual pressure drop was effected in the system at constant temperature, and the

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B107 B10

AUTHORS: Novikov, G. I., Andreyeva, N. V., Polyachenok, S. G.

TITLE: New method for the synthesis of low tungsten chlorides

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 5, no. 3, 1961, 1190-1193

TEXT: The object for the present study was to elaborate a method permitting the production of larger quantities (kilograms) of low tungsten chlorides. Production by reduction of WCl_6 with hydrogen is not advantageous, and for larger quantities it also requires special apparatus because of the danger of explosion hazard. This study gives theoretical considerations and their experimental confirmation with regard to the reduction of WCl_6 with phosphorus. On the basis of the thermodynamic data (S. A. Shadrakarev, G. I. Novikov et al., Referaty dokladov VIII Meneleevskogo "yezda. (Abstracts of the reports from the 8th Menleevskoye Congress on the Aktsiya fiz. khimii, M., 1958, p. 220), a good yield of the compounds WCl_5 and WCl_4

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New method for the synthesis...

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B107/B101

is found to form from WCl_6 and white phosphorus at $200^\circ C$. Moreover, the equilibrium of the reaction $[WCl_4]_s + (P_2Cl_3)_g = [WCl_5]_s + (POCl_3)_g$ at $200^\circ C$ lies almost entirely on the right-hand side, so that the final reduction product would be free of contaminating oxychloride (s = solid; g = gas). Phosphorus has also the advantage that it may be accurately dosed and the reaction conducted in the evacuated glass vessel. Red phosphorus was used for the experiments and the reaction temperature was therefore raised to $250-300^\circ C$. WCl_6 was prepared by reaction of tungsten with chlorine at $500-600^\circ C$. A glass apparatus (Fig.) was used for preparing low chlorides. WCl_6 and phosphorus were filled into vessel B. For the preparation of WCl_5 , slightly more than the stoichiometrically required quantity of phosphorus was used, slightly less for that of WCl_4 . The vessel is then evacuated and sealed at a. B is heated to $250-300^\circ C$, the volatile PCl_3 and $POCl_3$ are condensed in C. After the reaction, C is

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The ... were mutually soluble in the melt. ... data are given

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The following table shows the results of the analysis of the sample. The sample was found to contain the following compounds:

Compound	Amount (g)	Percentage (%)
CH ₂	1.2	12.0
CH ₃	1.8	18.0
CH ₄	2.4	24.0
CH ₅	3.0	30.0
CH ₆	3.6	36.0
CH ₇	4.2	42.0
CH ₈	4.8	48.0
CH ₉	5.4	54.0
CH ₁₀	6.0	60.0
CH ₁₁	6.6	66.0
CH ₁₂	7.2	72.0
CH ₁₃	7.8	78.0
CH ₁₄	8.4	84.0
CH ₁₅	9.0	90.0
CH ₁₆	9.6	96.0
CH ₁₇	10.2	102.0
CH ₁₈	10.8	108.0
CH ₁₉	11.4	114.0
CH ₂₀	12.0	120.0

These data differ slightly from the theoretical values for the pure compounds. This is due to the presence of impurities in the sample. The impurities were identified as follows:

Impurity	Amount (g)	Percentage (%)
CH ₂₁	0.2	2.0
CH ₂₂	0.4	4.0
CH ₂₃	0.6	6.0
CH ₂₄	0.8	8.0
CH ₂₅	1.0	10.0
CH ₂₆	1.2	12.0
CH ₂₇	1.4	14.0
CH ₂₈	1.6	16.0
CH ₂₉	1.8	18.0
CH ₃₀	2.0	20.0
CH ₃₁	2.2	22.0
CH ₃₂	2.4	24.0
CH ₃₃	2.6	26.0
CH ₃₄	2.8	28.0
CH ₃₅	3.0	30.0
CH ₃₆	3.2	32.0
CH ₃₇	3.4	34.0
CH ₃₈	3.6	36.0
CH ₃₉	3.8	38.0
CH ₄₀	4.0	40.0

The total amount of impurities is 20.0 g, which is 20.0% of the total sample weight. The remaining 80.0% of the sample is composed of the pure compounds listed in the first table.

Thermodynamic study of binary...

S/078/61/006/011/013 013
B101/B147

... membrane method. The formation entropy was calculated from the difference. Results are given in Table 2. There are 2 tables and 6 references: 4 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: G. Takeshikoj'ma. Electrochem. Soc. Japan, 20, 173 (1952); K. Nishihava, S. Tanda, T. Shimizu. Chem. Abstr., 46, 10826 (1952).

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: October 12, 1960

Table 2. Legend:

(a) Compound:
(b) ΔH_{form}
kcal/mole;
(c) ΔS_{form}
entropy
units/ r -mole.
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Соединение	$\Delta H_{обр}$		Соединение	$\Delta S_{обр}$	
	ккал/г-моль	ед. г-моль		ккал/г-моль	ед. г-моль
2 KCl-LaCl ₃	5,77 ± 0,25	4,2 ± 0,5	3 KCl-PrCl ₃	7,40 ± 0,47	+ 1,8 ± 0,3
KCl-3 LaCl ₃	6,66 ± 0,61	-7,4 ± 1,0	3 KCl-2 PrCl ₃	-14,08 ± 0,38	-17,5 ± 1,0
3 KCl-CeCl ₃	-6,34 ± 0,24	-1,0 ± 0,3	3 KCl-NdCl ₃	-15,36 ± 0,70	+ 1,2 ± 0,3
3 KCl-2 CeCl ₃	-12,60 ± 0,48	-16,4 ± 1,0	3 KCl-2 NdCl ₃	7,67 ± 0,37	-20,2 ± 1,0
KCl-3 CeCl ₃	-8,10 ± 0,82	10,0 ± 1,0			

NOVIEOV, G.I.; BAYEV, A.K.

Thermographic and calorimetric study of the systems $TiCl_3 - MCl$
(TR = La, Ce, Pr, Nd; M = K, Na). Vestnik Akad. Nauk SSSR Ser. Khim. Nauk
'71. (Systems (Chemistry)) (Rare earth chlorides--Thermal properties)
(Alkali metal chlorides--Thermal properties)

S/OA/02/000/001/000/000
 2101/2100

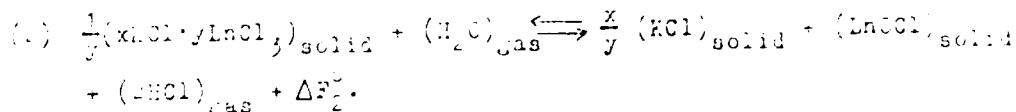
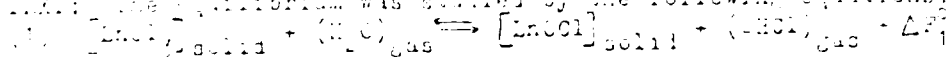
2450³

AUTHORS: NEVINSKY, S. I., KOLEV, A. N.

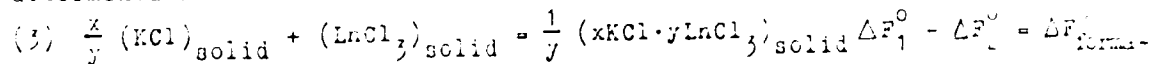
TITLE: Vapor hydrolysis of double chlorides and rare earths (La, Ce, Pr, Nd).

PUBLICATION: Lenin Coll. Univ. Inst. Vestnik. Seriya Khim. i Mekh. no. 1, 1962, 154-160

NOTE: The equilibrium was studied by the following equations:



The thermodynamic characteristics of the formation of double salts are determined from the difference between these reactions:



Card 1/3

8/25/68 / J.C.G. / 1/21/69
M.I. / 8/30

Vapor hydrolysis of K double ...

The examination was conducted by the static method with a Pirani type gage. The enthalpy of formation of KCl , $LaCl_3$, $3KCl \cdot 2CeCl_3$, $3KCl \cdot 2PrCl_3$, $3KCl \cdot 2NdCl_3$, $3KCl \cdot 2SmCl_3$, $3KCl \cdot 2EuCl_3$, and $3KCl \cdot 2GdCl_3$ was calculated from experimental data by the equation

$$\Delta S_{formation}^{\circ} = \frac{\Delta H_{formation}^{\circ}}{T} + 4.575 (\log K_1^{\circ} - \log K_2^{\circ})$$

Rare chlorides of rare earths were produced by chlorinating their oxides with $SOCl_2 + Cl_2$ at 400-700°C. They were distilled in a vacuum to give oxchloride traces. Double salts of rare earths were produced by the stoichiometric amounts of rare earth chlorides and K chloride at 200°C in evacuated quartz ampoules. The equilibrium of water vapor hydrolysis was determined in a quartz apparatus with a Pirani type gage. The temperature was measured with a platinum-rhodium thermocouple and kept constant with a BTF-01 (DIV-01) thermostat accurate to 0.5°C. The atmospheric pressure in the apparatus was measured with a gage accurate to 0.1 mm Hg. The more rare earth chlorides are contained in the double salts, the higher the vapor hydrolysis at the corresponding temperatures. The formation

Card 2/4

Thermodynamic Analysis of H₂O₂ ...

3/25/58/000/101/101
3121/013

... of the ...
 ... given in Table 1 were compared with published data. The
 relative thermal stability of these compounds is related from the data
 ...
 ...
 ... HCl·CO₂, HCl·H₂O, and HCl·H₂SO₄, ...
 ... There are 1 figure, 1 table, and 3 references ...
 ... The three references to English-language publications are:
 ... C. W. Koch et al. J. Amer. Chem. Soc., 71, 2, 349-350, 1949;
 ... C. W. Koch, and E. B. Cunningham. J. Amer. Chem. Soc., 76, 2, 1471-1472,
 1954; F. H. Spedding, I. L. Flinn, J. Amer. Chem. Soc., 71, 2, 1471-1472,

SWB I.TED: July 11, 1954

Legend to Table 1: (1) G. I. Jones; (2) present data; (3) kcal/g-mole;
 (4) e.v., (5) published data; (6) ΔH kcal/g-mole.

Card 3/4

X

NOVIKOV, G.I.; POLYACHENOK, O.G.

Study of the PrCl_3 - Pr system. Zhur.neorg.khim. 7 no.5:
1209-1210 My '62. (MLR# 15:7)

1. Leningradskiy gosudarstvennyy universitet, khimicheskoy
fakul'tet.

(Praseodymium chlorides) (Praseodymium)

Saturation vapor pressures of the ...

2/278/62/227/2 6/225/924
B106/B180

1093-1224°C for CeCl_3 , 1041-1192°C for PrCl_3 , and 962-1134°C for NdCl_3 .

The results are given in Fig. 5. Those for NdCl_3 are only approximate,

as the initial Nd was contaminated by ~6% Pr. Table 6 gives the boiling points, evaporation enthalpies, and evaporation entropies derived from the results. The boiling points are lower than the corresponding published data (S. I. Harrison, J. Amer. Chem., 2, 601 (1952); V. V. Serebrennikov, Khimiya redkozemel'nykh elementov (Chemistry of Rare Earth Elements), Tomsk, 1959, p. 293; R. C. Vickery, Chemistry of the Lanthanons, London, 1953, p. 229). The entropies of fusion were calculated from the melting points of the chlorides studied, and from the heats of fusion given in the above references (Table 7). The evaporation and sublimation enthalpies calculated mainly from experimental data are considerably higher than the published figures (An. N. Nesmeyanov, L. A. Sazonov, Zh. neorgan. khimii, 4, 230, 231 (1959)). There are 3 figures and 7 tables.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet
(Leningrad State University)

Card 2/8⁵

.../78/02/007/006/010/024
R106/P180

AUTHOR: Novikov, V. I., May 21, 1961

TITLE: The dependence of saturated vapor above melts in the system $\text{LnCl}_3\text{-KCl}$ (La, Ce, Pr, Nd)

Source: Journal of Physical Chemistry, v. 35, no. 5, p. 1170-1171, 1961

TEXT: The total vapor pressure above melts of the systems $\text{LnCl}_3\text{-KCl}$ ($\text{Ln} = \text{La, Ce, Pr, Nd}$) was studied in the temperature range 200-170°C using an existing modification of the "boiling point method" (sensitivity 0.1 mm Hg) for determining vapor pressures of low-volatility substances (V. I. Levizov, O. I. Polyanova, Zh. teoret. khimii, 6, 1781 (1961)). In the resulting diagrams ($\log p_{\text{total}} \text{ vs } 1/T, ^\circ\text{K}$) the lines of the total saturation vapor pressure for melts of different compositions lie between those of the pure components KCl and LnCl_3 . Their order agrees with the changes in concentration of the melts. There is non-monotonic variation in the rise of the vapor pressure line when passing from pure

Card 1/3

Pressure and composition of ...

07/19/2001 10:00 AM
R100,018

LnCl_3 salt mixtures containing over 90% KCl . This may be due to
dissociation of the compounds in the melt as the temperature rises. The
systems studied deviate considerably from ideal mixtures, in a way which
indicates considerable association in the salt melts. With the analytical
method used chemical analysis of the concentrates is possible. The sum of
the analytically determined elements was in good agreement with the
results of direct analysis of the concentrates. Comparison of the vapor
compositions with the corresponding compositions of melts showed that the
vapor contained far more LnCl_3 than could be expected if only KCl and LnCl_3
are actually soluble without the formation of double salts or their
evaporation on heating. Plots of vapor versus melt composition show
that some form of the double salts between KCl and LnCl_3 must be volatile.
The rare earth content of the vapor decreases with rising temperature,
which may be due to dissociation of the volatile forms of the compounds
in the melt. There are 9 figures and 10 tables.

Card 2/3

Pressure and composition of ...

S/075/62/007/006/010/024
B106/B180

AOS: NIATI : Leningradskiy gosudarstvennyy universitet
(Leningrad State University),

SUBMITTED: March 7, 1961

Card 3/3

NOVIKOV, G.I.; BAYEV, A.K.

Vapor hydrolysis of double chlorides of potassium and rare earth
elements. (La,Ce,Pr,Nd). Vest.LGU 17 no.4:154-160 '62. (MIRA 15:3)
(Rare earth chlorides)(Hydrolysis)

NOVIKOV, G.I.; BAYEV, A.K.

Characteristics of the evaporation of rare earth chlorides in
the systems KCl - LnCl₃ (La, Ce, Pr, Nd). Vest. LGU 17 no.16:89-
97 '62. (MIRA 15:9)
(Rare earth chlorides) (Systems (Chemistry))

3393
S/079 62 032/001 019/016
D204/D302

52300 (1273)

AUTHORS: Novikov, G. I. and Bayev, A. K.

TITLE: Saturated vapor pressures of liquid chlorides of cer-
tain lanthanons and over the systems MCl_3 , KCl , where
M = La, Ce, Pr, Nd

PERIODICAL: Zhurnal obshchey khimii, v. 43, no. 1, 1968, 11-16

TEXT: The vapor pressures were measured by a variation of the fa-
miliar 'view-point' method, over molten $LaCl_3$, $CeCl_3$, $PrCl_3$, and $NdCl_3$
 Cl_3 at 1124-1220°, 1093-1224°, 1041-1192° and 962-1194°C respecti-
vely. Dependence of the pressure on temperature was of the usual
form $\ln P = f(1000/T^\circ K)$ and ΔH_{evap} and ΔS_{evap} have been deter-
mined [Abstractor's note: ΔH and ΔS not defined but probably la-
tent heat and entropy]. Boiling points of $LaCl_3$, $CeCl_3$, $PrCl_3$, and
 $NdCl_3$ were found to be 1570°, 1555°, 1554° and 1551°C, i.e. 13°

Card 1/2

33953

S: 079/62/032.001.010.014
D204/D302

Saturated vapor pressures of

200°C below values quoted in the literature. Vapor pressures were also measured over 9 binary chloride systems of form $(MCl)_x \cdot KCl_y$ between ~1100°C and ~1600°C and the sublimates (10-15% of the original 0.45-0.50 g samples) were analyzed for Cl and M. It was found that the concentration of M in the vapors decreased at higher temperatures which is thought to be connected with the dissociation of volatile forms of the compounds. There are 2 tables and 8 references: 5 Soviet bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: E. Harrison, *J. Appl. Chem.*, 2, 601, 1952, Vickery, *Chemistry of the Lanthanons*, 1959 [Abstractor's note: Essentially complete translation].

SUBMITTED: January 30 1961

Card 2 2

YAN' GUI-FAN [Yen Kung-fan]; LI SHAO-CHZHUN [Li Shao-chung]; NOVIKOV, G.I.

Thermodynamic investigation of thorium oxychloride. Zhur.neorg.
khim. 8 no.1:89-93 Ja '63. (MIRA 16:5)
(Thorium chlorides--Thermodynamic properties)

SUN YUY-LIN', [Sung Yü-lin]; NOVIKOV, G.I.

Thermographic and calorimetric study of the system samarium trichloride-
potassium chloride. Zhur.neorg.khim. 8 no.3:700-703 Mr '63.

(MIRA 16:4)

(Samarium chloride)

(Potassium chloride)

(Thermal analysis)

L 17002-63

EWP(q)/EWT(m)/BDS AFFTC JD/JW/JG

S/078/63/008/005/002/021

AUTHOR: Novikov, G. I. and Polyachenok, O. G.58
57TITLE: A study of $\text{NdCl}_3\text{-Nd}$ and $\text{PrCl}_3\text{-Pr}$ system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. VIII, no. 5, May 1963, 1053-1059

TEXT: For the systems referred to in the title the authors obtain isotherms of vapor pressure at 1180° . By using the obtained thermographic and tensimetric data, the authors computed values of heat content (ΔH_{298}^0) and free energy (ΔF_{298}^0) for the formation of the solid dichlorides NdCl_2 and PrCl_2 :

$$\Delta H_{298}^0 = -169 \pm 3 \text{ kcal/mol} \text{ \& } -167 \pm 3 \text{ kcal/mol}$$

$$\Delta F_{298}^0 = -158 \pm 4 \text{ kcal/mol} \text{ \& } -156 \pm 4 \text{ kcal/mol.}$$

There are 4 figures and 4 tables. The most important English-language reference reads as follows: L. L. Quill, the Chemistry and Metallurgy of Miscellaneous Materials, 1950.

Card 1/2, ASSOCIATION: The Leningrad State University, Chemistry Department

I 10645-63

EPF(c)/EWF(q)/SWT(m)/DDG--AFETG/ASD--Pr-4--11/11/63

ACCESSION NR: AF3001226

S/0078/63/008/006/1526/1527

AUTHOR: Polyachenok, O. G.; Novikov, G. I.

63

TITLE: Vaporization of the rare earth element trichlorides

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 6, 1963, 1526-1527

TOPIC TAGS: vaporization, rare earth element trichlorides, LaCl sub 3, CeCl sub 3, PrCl sub 3, NdCl sub 3, ErCl sub 3, entropy, enthalpy

ABSTRACT: The boiling temperature, vapor pressure, entropy and enthalpy (heat content) were determined (experimentally) for La, Ce, Pr, Nd and Er trichlorides. They were calculated for all of the other rare earth trichlorides. Orig. art. has: 1 table and 1 equation.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet, Khimicheskiy fakul'tet (Leningrad State University, Department of Chemistry)

SUBMITTED: 12Nov62

DATE ACQD: 01Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 003

OTHER: 002

kes
Card 1/1

L 13049-63 EWP(q)/EWT(m)/BDS AFPTC/ASD JD/JG
ACCESSION NR: AP3003470 8/0078/63/008/007/1567/1573

AUTHOR: Polyachenok, O. G.; Novikov, G. I.

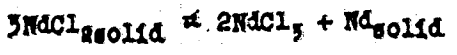
TITLE: Stability of lower rare-earth chlorides

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 7, 1567-1573

50
55

TOPIC TAGS: rare earth, rare-earth chloride, rare-earth enthalpy, rare-earth disproportionation, rare-earth reduction, Born-Haber cycle, lanthanide chloride, NdCl sub 3, NdCl sub 2, NdCl

ABSTRACT: The thermochemical data required for the determination of the stability of lower rare-earth chlorides have been obtained. The heats of formation of NdCl₂ and NdCl₃ were determined calorimetrically to be -163.2 and -246.5 kcal/mol, respectively. From these heats of formation the enthalpy change in the disproportionation of NdCl₂ by the reaction:



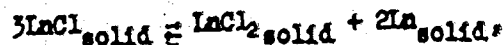
was calculated to be -3.4 kcal, and ΔS° , 15 ± 1 EU. The temperature of non-variant equilibrium of the disproportionation was found to be -46C, below which

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L 13049-63

ACCESSION NR: AP3003470

NdCl₂ is thermodynamically unstable and can only exist in the frozen state. The heats of formation of lanthanide (Ln) dichlorides in the solid state were calculated by means of the Born-Haber cycle and are given in Table 1 of the Enclosure. The data in Table 1 suggest that the heat of sublimation is the main factor which determines the heats of formation of the lower rare-earth chlorides. On the basis of the data given in Table 2, for LnCl₂ disproportionation by the reaction:



the following qualitative conclusions concerning the stability of the rare-earth dichlorides were made: 1) In addition to the known SmCl₂, EuCl₂, and YbCl₂, the stable dichlorides PmCl₂ and TmCl₂ can be obtained. 2) Among the less stable dichlorides, in addition to the known NdCl₂ and PrCl₂, it is apparently possible to obtain in the solid state DyCl₂ and HoCl₂, which are stable at elevated temperatures only, and ErCl₂, which is apparently stable at room temperature. 3) Formation of LaCl₂, CeCl₂, GdCl₂, and TbCl₂ cannot be expected in the solid state or in the melt. Calculation of the equilibrium constants for hydrogen reduction of LnCl₃ to LnCl₂ revealed the possibility of complete reduction of SmCl₃, EuCl₃, and YbCl₃, but of only partial reduction in the case of Nd, Pm, Dy, Ho, Er, or Tm. Calculation of heats of formation of LnCl by means of the Born-Haber cycle

Card 2/63

- 18 (2/57) -

L 13049-63

ACCESSION NR: AP3003470

and of ΔH° and ΔF° in its disproportionation by the reaction:



was carried out; the results are given in Table 3. It was determined that the formation of monochlorides in the solid and molten states is negligible. Orig. art. has: 7 tables, 11 formulas, and 1 figure.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet, Khimicheskiy fakul'tet
(Leningrad State University, Department of Chemistry)

SUBMITTED: 05Jun62

DATE ACQ: 02Aug63

ENCL: 03

SUB CODE: CH

NO REF SOV: 013

OTHER: 016

Card 3/63

ACCESSION NR: AP3003486

S/0078/63/008/007/1785/1786

AUTHOR: Polyachenok, O. G.; Novikov, G. I.

TITLE: On the pressure of saturated vapor in the LaCl_3 -La, PrCl_3 -Pr, and NdCl_3 -Nd systems

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 7, 1963, 1785-1786

TOPIC TAGS: rare earths, rare earth chlorides, lanthanum, praseodymium, neodymium, PrCl_3 , NdCl_3 , LaCl_3 , vapor pressure, solubility, boiling-point method, heat of reaction, Pr(II), Nd(II)

ABSTRACT: The vapor pressure of the PrCl_3 -Pr, NdCl_3 -Nd, and LaCl_3 -La systems and the solubility of the rare earths in the chlorides of these systems were determined in the 1180—1350°C range. The vapor-pressure samples weighing 0.1—0.2 g were measured by the "boiling-point" method in heavy-walled quartz ampoules lined with molybdenum to prevent reaction of the rare earths with quartz. Vapor-pressure diagrams plotted (see Enclosure), indicate that

Card 1/5

ACCESSION NR: AP3003486

dissolution of atomic La occurs and that ions of Pr(II) and Nd(II) form in the melt. In all three systems the trichloride was the only compound to vaporize. Instability of the dichlorides in the vapor phase is probably associated with their high heat of vaporization. The positive deviation from Raoult's law observed in the PrCl_3 -Pr system may be attributed to the presence of some atomic Pr. The experimental heat of vaporization in the single-phase region was close to that of the pure chlorides (LaCl_3 , PrCl_3 , and NdCl_3), indicating that the overall heat effect of processes occurring during the dissolution of the trichlorides in the melt was close to zero. The difference between the heat of vaporization of the pure trichlorides and that of NdCl_2 and PrCl_2 in the phase-separation region is governed by the heat of reaction of the disproportionation of the dichlorides. The latter was found to be 38 ± 10 kcal for NdCl_2 at an average temperature of 1250°C , and 24 ± 10 kcal for PrCl_2 at an average temperature of 1230°C . For thermodynamic calculations from the data obtained on the disproportionation of the dichlorides, more precise information concerning the nature of ions formed in the melt on dissolution of the metals, as well as experimental data on

Card 2/5

ACCESSION NR: AP3003486

specific-heat of the trichlorides and dichlorides, would be required. Orig. art. has: 1 figure.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet. Khimicheskiy fakul'tet (Leningrad State University, Chemistry Faculty)

SUBMITTED: 27Dec62 DATE ACQ: 02Aug63 ENCL: 02

SUB CODE: 00 NO REF SOV: 004 OTHER: 002

Card 3/5

ACCESSION NR: AP3003486

ENCLOSURE: 01

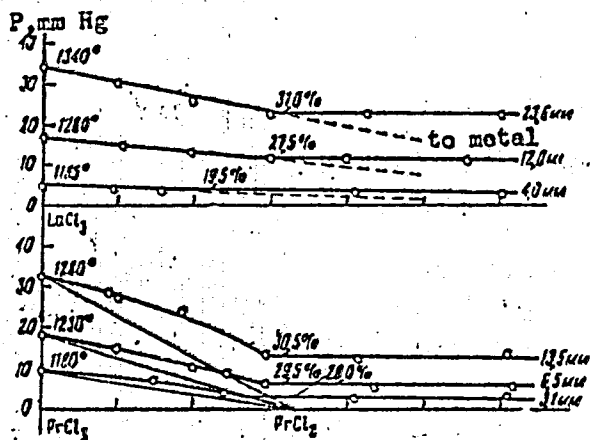


Fig. 1. Vapor pressure in the LaCl₃-La and PrCl₃-Pr₂ systems

Card 4/5

ACCESSION NR: AF3003486

ENCLOSURE: 02

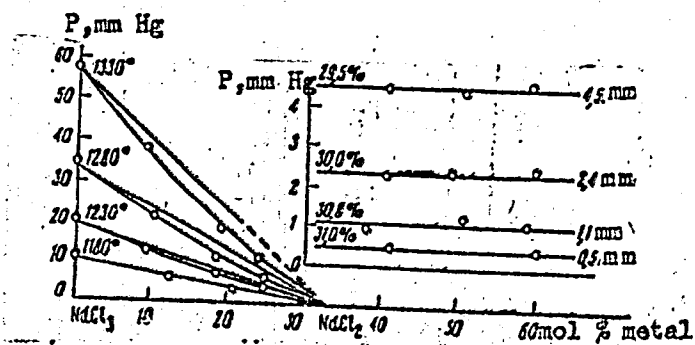


Fig. 2. Vapor pressure in the NdCl₃-Nd system

Card 5/5

SECRET

... ..
... ..
... ..

POLYACHENOK, G.G.; NOVIKOV, I.I.

Saturated vapor pressure of ...
khim. Zh. no. 11 (1964) p. 1111.

1. Leningradskiy gosudarstvennyy ...

POLYACHENOK, O.G.; NOVIKOV, G.I.

Thermodynamic study of di- and trichlorides of rare-earth elements.
Vest. LGU. 18 no.16:133-134 '66. (MIRA 16:11)

POLYACHENOK, O.G.; NOVIKOV, G.I.

Saturated vapor pressure of metallic cerium. *Zhur. obshch. khim.*
33 no.8:2796-2797 Ag 1963.

Dichlorides of rare-earth elements. *1969* *MIRA* 1:111

1. Leningradskiy gosudarstvennyy universitet.

L 18181-63
ACCESSION NR: AP3006833 EWP(q)/EWT(m)/BDS AFFTC/ASD JW/JG/JD
S/0079/63/033/008/2797/2797

AUTHOR: Polyachenok, O. G.; Novikov, G. I.

60
55

TITLE: Investigation of dichlorides of rare-earth elements

27

SOURCE: Zhurnal obshchey khimii, v. 33, no. 8, 1963, 2797

TOPIC TAGS: rare earth metals, dichlorides, phase diagram, thermal analysis, preparation, solubility, bivalent ion formation, standard enthalpy of formation, neodymium, NdCl₃, NdCl₂, PrCl₂, chlorides, samarium, SmCl₃, SmCl₂, EuCl₂, EuCl₃, YbCl₂, YbCl₃, ScCl₂, ScCl₃, scandium, yttrium, LaCl₃, lanthanum, praseodymium, PrCl₃

ABSTRACT: In a study of rare earth dichlorides the phase diagrams of the SmCl₃-Sm, ScCl₃-Sc, and YCl₃-Y systems have been obtained by thermal analysis. In the SmCl₃-Sm system a stable compound, SmCl₂ (m.p. 3530), and an intermediate compound, SmCl₃·4SmCl₂ (decomposes on melting), were formed. Reaction of SmCl₃ with metallic samarium is considered to be the best method for obtaining pure
Card 1/2

L 18181-63
ACCESSION NR: AP3006833

5

SmCl_2 . Compounds EuCl_2 and YbCl_2 are readily obtained by reduction of the trichlorides with metallic zinc. Scandium dichloride (ScCl_2) melted at 806C with decomposition. In the ScCl_3 -Sc system the intermediate compound $2\text{ScCl}_3 \cdot \text{ScCl}_2$, which decomposes on melting, was obtained. The solubility of yttrium in YCl_3 was only 2 mol% at the eutectic temperature, 716C. Vapor pressure measurements for the LaCl_3 -La, PrCl_3 -Pr, NdCl_3 -Nd, YCl_3 -Y, and ScCl_3 -Sc systems show that atomic dissolution of La and Y occurs and that divalent ions of Pr^{2+} , Nd^{2+} , and Sc^{2+} are formed in the melt. For the disproportionation of the dichloride to the trichloride and the metal, ΔH° was found to be 13 kcal/mole for NdCl_2 and 8 kcal/mole for PrCl_2 ; in both cases ΔS° was equal to 3 eu (at an average temperature of 1250C). The standard enthalpy of formation was -163.2 kcal/mole for NdCl_2 and -246.5 kcal/mole for NdCl_3 . For solid PrCl_2 and ScCl_2 the enthalpy of formation was approximately -163 and -145 kcal/mole, respectively.

ASSOCIATION: none

SUBMITTED: 22 Feb 63

DATE ACQ: 30 Sep 63

ENCL: 00

SUB CODE: CH

NO REF SOV: 000

OTHER: 000

Card 2/2

ACCESSION NR: AP4012450

S/0078/64/009/002/0472/0475

AUTHORS: Norikov, G. I.; Polyachenok, O. G.; Frid, S. A.

TITLE: Fusibility diagrams of systems formed by samarium and ytterbium di- and trichlorides with potassium chloride

SOURCE: Zhurnal neorg. khim., v. 9, no. 2, 1964, 472-475

TOPIC TAGS: samarium dichloride, samarium trichloride, ytterbium dichloride, ytterbium trichloride, potassium chloride, binary chloride fusibility, fusibility diagram

ABSTRACT: This work resulted from the lack of data on the stabilizing action of alkali halides on the dihalides of rare earths. The formation of solid phase compounds was observed and complexes were traced in the liquid and gaseous phases of trichlorides. Since there also is no literary data on the effect of KCl on rare earth dichlorides, fusibility tests of Sm and Yb di- and trichlorides with KCl were made and fusibility diagrams plotted. It was found that the solid state compound $KCl \cdot 2SmCl_2$ decomposes during melting, while $KCl \cdot YbCl_2$ melts without decomposition. There is a similarity of

Card 1/2

ACCESSION NR: AP4012450

these fusibility diagrams with those of $\text{SrCl}_2\text{-KCl}$ and $\text{CaCl}_2\text{-KCl}$ due to the similarity of ionic radii of Sr^{2+} - Sm^{2+} and Ca^{2+} - Yb^{2+} (1.27 and 1.06 Å). The $\text{SmCl}_3\text{-KCl}$ system showed, in addition to the $3\text{KCl}\cdot\text{SmCl}_3$ and $2\text{KCl}\cdot\text{SmCl}_3$ (already known), a new compound $\text{KCl}\cdot 2\text{SmCl}_3$, while the $\text{YbCl}_3\text{-KCl}$ system forms only $3\text{KCl}\cdot\text{YbCl}_3$. Complex ions were observed in the liquid state. It was also found that a marked influence of KCl on the relative stability of rare earth di- and trichlorides can only be expected for neodymium dichloride. Orig. art. has: 2 Figures.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet, khimicheskii fakultet (Leningrad State University, Department of Chemistry)

SUBMITTED: 04Jun63

DATE ACQ: 26Feb64

ENCL: 00

SUB CODE: CH

NR REF SOV: 007

OTHER: 005

Card 2/2

NOVIKOV, G.I.; GAVRYUCHENKOV, F.G.

Pressure of saturated vapors of the chlorides of Ca, Sr, Ba.
Zhur. neorg. khim. 9 no.2:475-476 F'64. (MIRA 17:2)

KURBANOV, A.R.; SUVOROV, A.V.; SHCHUKAREV, S.A.; NOVIKOV, G.I.

Thermodynamics of tantalum chlorides. Zhur. neorg. khim. 9
no.3:520-525 Mr '64. (MIRA 17:3)

ACCESSION NR: AP4029180

B/0078/64/009/004/0773/0777

AUTHOR: Polyachenok, O. G. ; Novikov, G. I.

TITLE: Dissociation pressures of samarium, europium and ytterbium trichlorides

SOURCE: Zhurnal neorganicheskoy khimii, v. 9, no. 4, 1964, 773-777

TOPIC TAGS: samarium trichloride, europium trichloride, ytterbium trichloride, dissociation pressure, thermodynamic characteristic, static method, zero manometer, dissociation constant, heat of formation, entropy of formation, hydrogen reduction, samarium dichloride, europium dichloride, ytterbium dichloride, solid trichloride, liquid trichloride, solid dichloride, liquid dichloride

ABSTRACT: The dissociation pressures of molten SmCl_3 , EuCl_3 , YbCl_3 ($\text{LnCl}_3\text{liq.} \rightleftharpoons \text{LnCl}_2\text{liq.} + 1/2\text{Cl}_2$) were measured, and from these the thermodynamic characteristics for these rare earth di- and trichlorides were calculated. The chlorine pressures at temperatures up to 1000C were measured by the static method with a quartz-membrane zero manometer (G. I. Novikov, A. V. Suvorov).

Card 1/3

ACCESSION NR: AP4029180

Zavodsk. laboratoriya, 25, 750 (1959)). The dissociation constants for SmCl_3 and YbCl_3 were calculated according to the equation: $\kappa = \frac{2V}{RT_0} \cdot \frac{P_{\text{Cl}_2}}{T}$, and of EuCl_3 , in which chlorine formation is much greater, by the equation: $\kappa = \frac{2V P_{\text{Cl}_2}}{RT_0 - 2r_{\text{Cl}_2} V}$

From these data the standard heat and entropy of formation of the Sm, Eu and Yb di- and trichlorides were calculated. The data agree with literature values. Calculations were also carried out for the equilibrium in the dissociation of the solid trichlorides according to the equation: $\text{LnCl}_3(\text{solid}) \rightleftharpoons \text{LnCl}_2(\text{solid}) + 1/2\text{Cl}_2$ and for the reduction of the trichlorides with hydrogen: $\text{LnCl}_3 + 1/2\text{H}_2 \rightleftharpoons \text{LnCl}_2 + \text{HCl}$. The equilibrium chlorine pressures over the molten trichlorides at 1100-1400 C were determined:

$$\begin{aligned} \text{SmCl}_3, \lg P_{\text{Cl}_2}, \text{mm. Hg.} &= 41,82 - \frac{17450}{T} - 9,061 \lg T \\ \text{EuCl}_3, \lg P_{\text{Cl}_2}, \text{mm. Hg.} &= 41,79 - \frac{17300}{T} - 9,061 \lg T \\ \text{YbCl}_3, \lg P_{\text{Cl}_2}, \text{mm. Hg.} &= 41,65 - \frac{16800}{T} - 9,061 \lg T \end{aligned}$$

Cont. 2/3

ACCESSION NR: AP4029180

Orig. art. has: 3 tables and 5 formulas

ASSOCIATION: Leningradskiy gosudarstvennyy universitet Khimicheskoy
fakul'tet (Leningrad State University, Chemistry Faculty)

SUBMITTED: 08Feb63

DATE ACQ: 29Apr64

ENCL: 00

SUB CODE: PH, CH

NO REF SOV: 004

OTHER: 006

Card 3/3

ACCESSION NR: AP4029196

S/0078/64/009/004/1017/1019

AUTHOR: Frid, S. A.; Polyachenok, O. G.; Novikov, G. I.

TITLE: Vapor pressure and vapor composition in the potassium chloridesamarium, ytterbium, calcium and strontium dichloride systems

SOURCE: Zhurnal neorganicheskoy khimii, v. 9, no. 4, 1964, 1017-1019

TOPIC TAGS: potassium chloride containing system, samarium dichloride containing system, ytterbium dichloride containing system, calcium dichloride containing system, strontium dichloride containing system, vapor pressure, vapor composition, KCl-SmCl₂ sub 2 system, KCl-YbCl₂ sub 2 system, KCl-CaCl₂ sub 2 system, KCl-SrCl₂ sub 2 system

ABSTRACT: The saturated vapor pressures in the KCl-SmCl₂, KCl-YbCl₂, KCl-CaCl₂ and KCl-SrCl₂ systems, and the gross vapor composition of the latter two systems were determined. The saturated vapor pressures were obtained by the "boiling point" method at 1050 and 1150 C above melts containing 25, 50 and 75 mol.% KCl (figs. a, b). The data show the systems deviate from Raoult's law only slightly, and that the KCl-CaCl₂ and KCl-YbCl₂, and the KCl-SrCl₂ and KCl-SmCl₂ systems are

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ACCESSION NR: AP4029196

similar. The gross composition of the vapor (the potassium and the alkaline earth content) at 1050 and 1150 C was determined by flame photometry. The data show the alkaline earth dichloride potassium chloride ratio is independent of temperature. This ratio (MCl_2/KCl) does decrease with increase in initial KCl content in the melt, and decreases in going from Ca to Sr. Orig. art. has: 3 tables, 1 figure.

ASSOCIATION: Leningradakiy gosudarstvennyy universitet im. A. A. Zhdanova
Khimicheskii fakul'tet (Leningrad State University, Chemistry Faculty)

SUBMITTED: 30Sep63

DATE ACQ: 29Apr64

ENCL: 01

SUB CODE: GP, GC

NO REF SOV: 008

OTHER: 003

Card 2/3

ACCESSION NR: 24029196

ENCLOSURE: 01

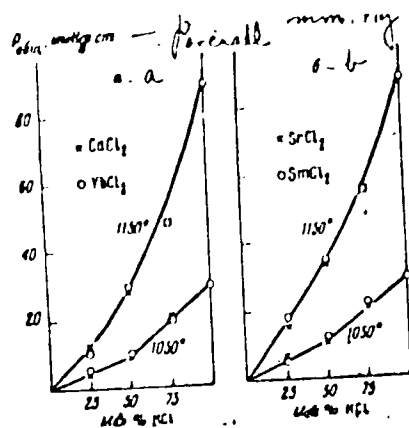


Fig. Saturated vapor pressure-composition diagram in the systems:
 a--KCl-CaCl₂ and KCl-YbCl₂; b--KCl-SrCl₂ and KCl-SmCl₂.

Card 3/3

ACCESSION NR: AP4040531

S/0074/G4/033/006/0732/0747

AUTHOR: Novikov, G. I.; Polyachenok, O. G.

TITLE: Halides of the rare earth elements at a lower oxidation state

SOURCE: Uspekhi khimii, v. 33, no. 6, 1964, 732-747

TOPIC TAGS: literature review, survey, rare earth element, rare earth metal compound, divalent rare earth compound, rare earth dihalide, rare earth trihalide, metallothermal reduction, hydrogenation, vacuum dissociation, divalent rare earth oxychloride, divalent rare earth oxide, divalent rare earth chalcogenide, divalent rare earth sesquioxide, divalent rare earth telluride, divalent rare earth sulfide, physical property, physical chemical property, calorimetry, heat of formation, enthalpy of formation, phase diagram, saturated vapor pressure, electric conductivity, density, dissociation, free energy, entropy, rare earth dichloride, rare earth difluoride

ABSTRACT: This literature review is directed to the rare earth elements in the divalent state, particularly to their halogen compounds which must occur as intermediates in the production of the rare earth metals during the electrolysis or

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1/3

ACCESSION NR: AP4040531

metallothermal reduction of the trihalides. Knowledge of the properties of the halides would help establish optimum process conditions and reduce electrolytic losses. It is thought that the differences in the stabilities in the lower degree of oxidation might be utilized in the separation of the elements. This summary includes a short outline of the chemistry of the compounds of the rare earth elements in the lower oxidation state, the properties and the synthesis of the rare earth dihalides (hydrogenation, vacuum distillation, metallothermal reduction including reaction with the corresponding rare earth metal, of the rare earth trihalides) and of the oxychlorides, oxides, and chalcogenides (sulfides, selenides, tellurides). Particular attention is given to the physical and physical-chemical studies on the rare earth dichlorides. Also discussed are the calorimetry of the dichlorides and determinations of their heat and enthalpy of formation, phase diagrams, saturated vapor pressures, electric conductivities and densities of the rare earth trichloride-rare earth metal systems, the dissociation of Sm, Eu, and Yb trichlorides: $\text{LnCl}_3(\text{l}) \rightleftharpoons \text{LnCl}_2(\text{l}) + \frac{1}{2}\text{Cl}_2(\text{g})$ and their free energy, heat of formation and entropy. Summarizing the possibility of the existence of rare earth dihalides, the authors conclude that stable PrCl_2 and TuCl_2 should be obtainable in addition to the known Nd, Sm, Er, Yb and Sc dichlorides, and the less stable HoCl_2 and KrCl_2 should also be obtainable in addition to FrCl_2 , but La, Ce,

Card 2/3

[Faint, illegible text]

NOVIKOV, G.I.; GILITSKIY, N.V.

Thermal stability of the higher chlorides of chromium and
molybdenum. Zhur. neorg. khim. 10 no.3:576-582 Apr 1965.
(MIRA 18:7)

L 61083-65 EPF(c)/EPF(n)-2/EPA(s)-2/ENP(j)/ENT(m)/ENP(b)/T/ENP(t) Po-4/Pr-4/Pt-7/
 Pu-4 TJP(c) RM/WH/JD/JG

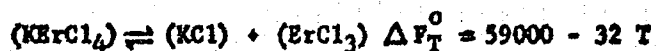
ACCESSION NR: AP5018250

UR/0078/65/010/007/1668/1674
546.666'131 + 32'13150
BAUTHOR: Novikov, G. I.; Gavryuchenkov, F. G.TITLE: Complex formation in the vapor phase of the system erbium trichloride - potassium chloride

SOURCE: Zhurnal neorganicheskoy khimii, v. 10, no. 7, 1965, 1668-1674

TOPIC TAGS: erbium compound, erbium chloride, potassium chloride, potassium compound, complex formation, rare earth

ABSTRACT: Data were obtained on the volatility and stability in the vapor phase of the complex KErCl_4 in the $\text{KCl} - \text{ErCl}_3$ system at 800-1200C. From the experimental data on the saturated vapor pressure as a function of temperature, the thermodynamic characteristics of the equilibrium

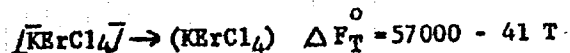


and of the hypothetical sublimation process

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ACCESSION NR: AP5018250



were calculated. The existence of the compound KErCl_4 in the vapor phase is indicated by the fact that a maximum appears on the curve representing the partial pressures of ErCl_3 and KCl versus the composition of the melt (the other pure substances present in the vapor are ErCl_3 , KCl , and K_2Cl_2). On the basis of certain data obtained and also literature data, it is concluded that the formation of stable complex compounds takes place in $\text{KCl} - \text{LnCl}_3$ systems (which include the entire rare earth family, Ln being a lanthanide). The compound KLnCl_4 , which does not exist in the crystalline state, vaporizes from the melts, and its content in the vapor increases in the La - Lu series. Orig. art. has: 5 figures, 4 tables, and 19 formulas.

ASSOCIATION: none

SUBMITTED: 18Apr63

ENCL: 00

SUB CODE: IC

NO REF SOV: 007

OTHER: 010

Card

2/2

BAYEV, A.K.; NOVIKOV, G.I.

Thermodynamic study of rare-earth oxychlorides. Zhur.georg.khim.
10 no.11:2457-2464 N '65. (MIRA 18:12)

1. Leningradskiy gosudarstvennyy universitet, khimicheskoy fakul'-
tet. Submitted May 12, 1964.

NOVIKOV, G.I.; GAVRYUCHENKOV, P.G.

Pressure and composition of saturated vapor in the
InCl₃ - BrCl₃ system. Zhur. teory. khim. 10 no. 2:

2706-2711 D. 61.

(11 A 191)

NO. 180, G. I.; POLYMERIZATION, V. D.

Pressure and composition of saturated vapor of
NaCl - LaCl₃ system. *Zhur. neorg. khim.* 10 no. 12: 2712-2714
D 1961. (USSR 1961)

L 54959-65 EWT(m)/EPF(c)/EPF(n)-2/EWP(t)/EWP(b) Pr-4/Pu-4 IJP(c) JD/JG

ACCESSION NR: AP5014164

UR/0080/65/038/005/1160/1161

546.65'131

29
28
B

AUTHOR: Novikov, G. I.; Tolmacheva, V. D.

TITLE: Preparation of anhydrous chlorides of the rare earth elements

SOURCE: Zhurnal prikladnoy khimii, v. 38, no. 5, 1965, 1160-1161

TOPIC TAGS: anhydrous chloride, chloride, rare earth element, carbon tetrachlorite

ABSTRACT: High purity anhydrous lanthanum and erbium chlorides (LaCl_3 , ErCl_3) were prepared from $\text{La}_2(\text{C}_2\text{O}_4)_3$ and $\text{Er}_2(\text{C}_2\text{O}_4)_3 \cdot 4.5 \text{H}_2\text{O}$, respectively. In each case a 3 to 4 gram sample of oxalate was placed in a quartz vessel and a mixture of CCl_4 and chlorine was blown over the sample for 30-40 minutes at 200°C in order to remove air and moisture. Then the temperature was raised to 400° to 450°C and the oxalate sample was subjected to the CCl_4 - Cl_2 mixtures (chlorine saturated with carbon tetrachloride at room temp.) for 2.5 to 3 hours. The flow rate of the CCl_4 + Cl_2 mixture was about 3 to 4 l/hr. Finally the temperature was raised for a short time to 600°C . The resulting product was found analytically to be close to 100% LaCl_3 or ErCl_3 . Spectral analysis showed the total impurity (Fe, Al, Ca, Mg,

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L 54959-65

ACCESSION NR: AP5014164

Ti, Cr, and Mn) to be less than 0.1%. It is concluded that this method may apply also to other rare earth elements since all the oxalates of rare elements decompose at a temperature close to 400°C. Orig. art. has: 1 table, 1 figure, and 2 formulas.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet imeni A. A. Zhdanova
(Leningrad State University)

SUBMITTED: 21Nov63

ENCL: 00

SUB CODE: IC, GC

NO REF SOV: 002

OTHER: 009

Card 272

TARASOV, A.V.; POSPELOV, A.E.; NOVIKOV, G.I.

Pressure and vapor composition in the systems $\text{NaCl} - \text{CaCl}_2$ and
 $\text{KCl} - \text{CaCl}_2$. Vest.LGU 20 no.22:101-108 '65.

(MIRA 18:12)

L 39092-66

EMIC/401/111/111(6)

JD/JM/JG

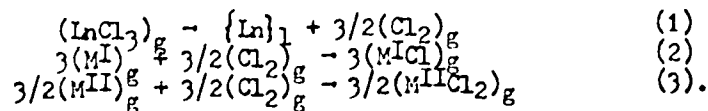
ACC NR: AP6021966

SOURCE CODE: UR/0153/66/009/002/0180/0180

AUTHOR: Novikov, G. I.; Bayev, A. A.ORG: Inorganic Chemistry Department, Leningrad State University im. A. A. Zhdanov
(Kafedra neorganicheskoy khimii, Leningradskiy gosudarstvennyy universitet)TITLE: Thermodynamic characteristics of the reaction of rare earth chlorides with hydrogen and certain metals in the gaseous stateSOURCE: ^vIVUZ. ^vKhimiya i khimicheskaya tekhnologiya, v. 9, no. 2, 1966, 180-184

TOPIC TAGS: free energy, rare earth chloride, alkali metal, alkaline earth metal, hydrogen

ABSTRACT: Published data on the thermodynamics of rare earth chlorides are used to examine their reactions with certain elements of groups I and II of the periodic system in the gaseous state. These reactions are:



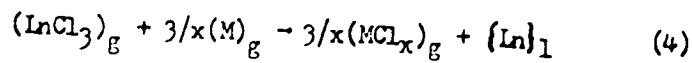
ΔZ^0 at 1000 and 1900°K for (1), (2), and (3) was calculated for various rare earth elements. From these data, values of the free energy of the overall reaction

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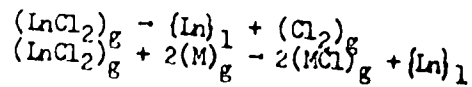
UDC: 536.77:661.865

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ACC NR: AP6021966



at the same temperatures were calculated for $1/2(\text{H}_2)$, Li, Na, K, Ca, Mg, and Zn. It is apparent from the equation itself that the reaction in the gaseous state is easier the greater the exothermic effect of formation of (MCl_x) from M and Cl_2 . In group I, Li reacts most readily with the trichloride, and in group II, Ca does. The free energy of the reactions



(where Ln = Sm, Eu, Yb) was also calculated for $1/2(\text{H}_2)$, Li, Na, K, Ca, Mg, and Zn. Orig. art. has: 6 tables and 4 formulas.

SUB CODE: 07/ SUEM DATE: 02Jun64/ ORIG REF: 011/ OTH REF: 002

L 44731-66 ENT(m)/EMP() TR IN()
ACC NR: AP6020368 (N) SOURCE CODE: UR/0078/66/011/003/0498/0503

AUTHOR: Su, Mien-tseng; Novikov, G. I.

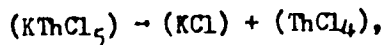
ORG: none

TITLE: Vapor pressure and composition in the KCl-ThCl₄ system

SOURCE: Zhurnal neorganicheskoy khimii, v. 11, no. 3, 1966, 498-503

TOPIC TAGS: vapor pressure, potassium chloride, thorium compound, potassium compound, strontium compound, lanthanum compound

ABSTRACT: In this work, which constitutes the first attempt to study compounds of Ml-Cl-ThCl₄ systems in vapor form, the total vapor pressure in the KCl-ThCl₄ system was measured by the boiling point method. The vapor pressure data obtained by analyzing the condensates over the melts can be explained only by assuming that a complex compound to which the composition KThCl₅ was ascribed by analogy with NaZrF₅ passes into the vapor state (the other substances present in the vapor are KCl, K₂Cl₂, and ThCl₄). On the basis of the experimental data, the equilibrium constants were calculated for the dissociation of this complex:

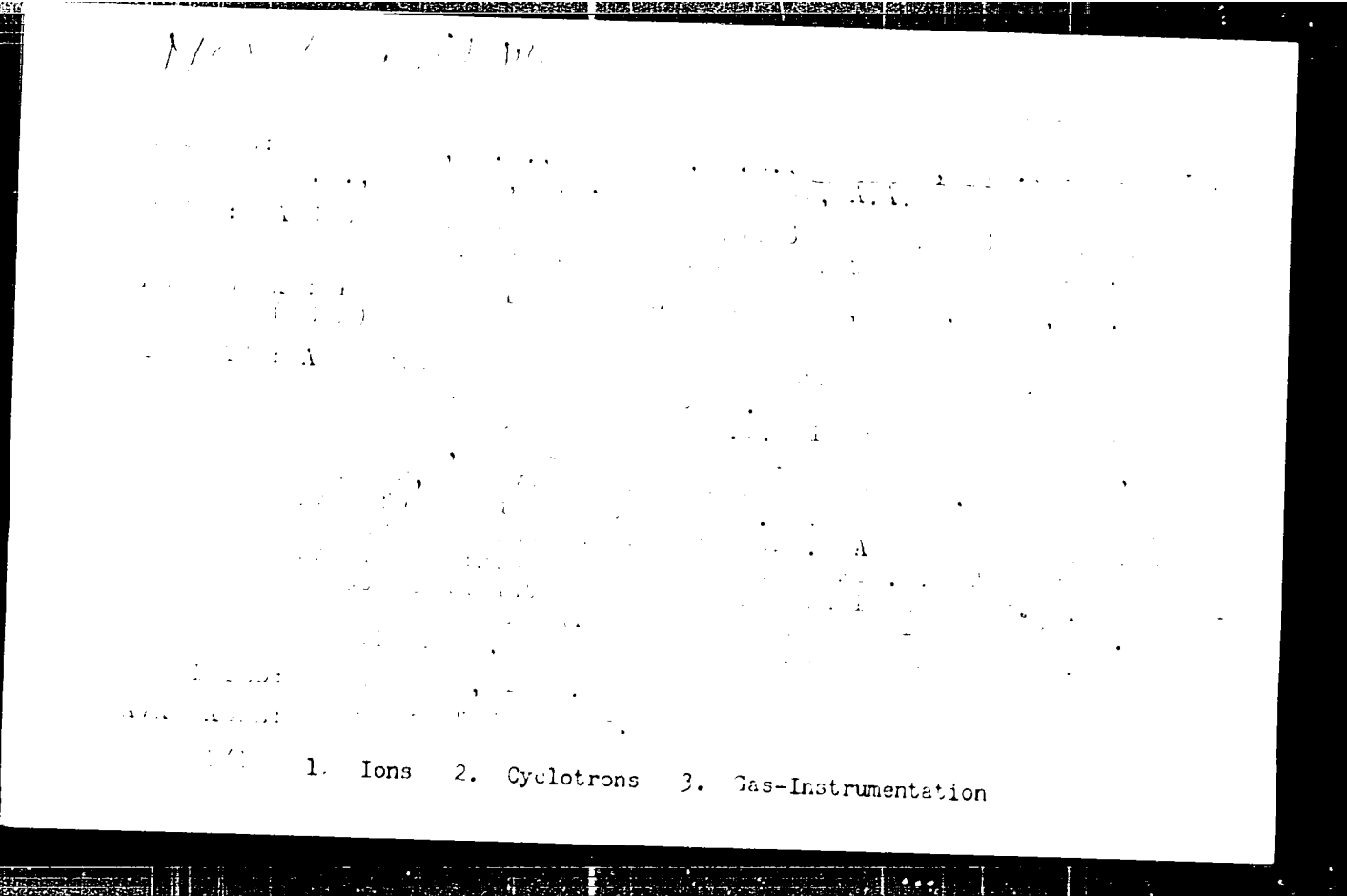


Card 1/2

UDC: 546.841:4*131+546.32*131+531.7

ARONOV, I.A.; NOVIKOV, G.Kh.

Time relay with a cold-cathode thyatron. Priborostroenie no.3:
28-29 Mr '59. (MIRA 12:4)
(Electronic instruments) (Time signals)



WINTER, S. W.

"Methods of Treating Electric and Acoustic Noise," *Wintner, S. W.*, 1954.

Ph.D., *Acoustic Noise Control*, *Ph.D. Thesis*, *Acoustic Noise Control*.

Dr. S. W. Winter. -cl 1-.

1. NOVIKOV, G. M., Prof. NOVIKOV, A. M. Docent
2. USSR (600)
4. Abdomen - Diseases
7. Acute pancreatitis associated with the clinical picture of acute abdomen.
Khirurgiia, no. 12, 1952

9. Monthly List of Russian Accessions, Library of Congress, May 1953. Unclassified.

NOV 1957
NOVIKOV, G.N.

Give careful attention to the suggestions of public inspectors.
Bezop.truda v prom. 1 no.10:34 O '57. (MIRA 10:11)

1. Tekhnicheskiy inspektor Stalinskogo obkoma profsoyuza rabochikh
ugol'noy promyshlennosti.

(Stalino Province--Mine inspection)

BOGOSLOVSKIY, Andrey Mikhaylovich; ZDANOVICH, Vasilii Leont'yevich;
MATVEYEV, Yevgeniy Nikolayevich; MUMZI, Georgiy Fedorovich;
MSHANETSKIY, Boris Antonovich; NEBESNOV, Viktor Ivanovich;
NOVIKOV, Georgiy Nikolayevich [deceased]; NUD'GA, Pavel
Korneyevich; SAPHYKIN, Aleksey Petrovich; SACHKOVSKIY,
Georgiy Semenovich; FRENK, M.TS., obshchiy red.; MELBYEV,
A.S., red.; TIKHONOVA, Ye.A., tekhn.red.

[Textbook for engineers on marine internal combustion engines]
Uchebnoe posobie dlia mekhanika III razriada po sudovym dviga-
teliam vnutrennego sgoraniia. Izd.2., perer. Pod obshchei red.
M.TS.Frenka. Moskva, Izd-vo "Morskoi transport," 1959. 711 p.
(Marine engineering) (MIRA 12:9)

NOVIKOV, G. M.

Novikov, G. M. "Studies on the ecology of salt-resisting plants," Trudy
Botan. in-ta im. Komarova, Eksperim. botanika, Issue 6, 1948, p. 200-17 - Bibliog:
14 items

SO: U-3264, 10 April 53, (Letopis 'Zhurnal 'nykh Statey, No. 4, 1949).

NOVIKOV, G. N.

58/4917

USSR/BIOLOGY
Desert Plants
Water Balance

Sep/Oct 48

"Water Balance of Certain Desert Plants," G. N. Novikov (deceased), Bot Inst Imeni V. I. Komarov, Acad Sci USSR, 4 pp

"Botan Zhur" Vol XXXIII, No 5

Studied water balance of following plants:

Sphaera hypericifolia L., *Kochia prostrata* (L.)

Schrad., *Artemisia sublesingiana* Keller,

Artemisia truncata (Schrenk), *Atriplex cana* C. A. M., and *Statice suffruticosa* L.. Tables show

58/4917

USSR/BIOLOGY (Contd)

Sep/Oct 48

daily variation in water content in the assimilating organs in various periods of vegetation, transpiration in grams per hour per gram of fresh weight, maximum daily variation in water content, etc. Submitted 16 Apr 48.

58/4917

CHUMAKOV, I.S.; YARMIZIN, O.D.; NOVIKOV, G.N.; MAKAROVSKIY, S.A.

Cenozoic sediments of the Leninogorsk trough in the Rubnyy Altai and
the basic stages of its formation. Trudy Kom.chetk.per. 22:128-138
'63. (MIRA 17:2)

NOVIKOV, G.N., inzhener.

Centralized electric power supply for lumber enterprises. Mekh.
trud.rab. 8 no.7:32-37 O-H '54. (MLBA 8:1)
(Lumbering) (Electric power production)

BOVIKOV, G.N., inzhener; GAVRIKOV, V.P., inzhener.

The KL gantry crane. Mekh.trud.rab.10 no.4:31-24 Ap '56.
(Cranes, derricks, etc.) (MLRA 9:7)

NOVIKOV, G.N., inzhener, GAVRIKOV, V.P., inzhener.

Using winches with continuous motion cables in lumber skidding.
Mekh.trud.rab. 10 no.10:36-39 0 '56. (MIRA 10:1)
(Lumbering--Machinery)