MARKOV, A.Ya., dots. (Ryazan')

Diagnosis of cancer of the ovaries. Fel'd. i akush. 23 no.2:25-28 F '58. (MIRA 11:3)

(OVARIES--CANCER)

MARKOV, A.Ye., kand.med.nauk

Diagnostic errors in defects of uterine development. Zdrav. Belor. 5 no.10:26-27 O '59. (MIRA 13:2)

1. Iz kafedry akusherstva i ginekologii (zaveduyushchiy - prof. G.N. Smirnov) Ryazanskogo meditsinskogo instituta.
(UTERUS--ABNORMITIES AND DEFORMITIES)

MARKOV, A.Ya., dots. (Khar'kov)

Tuberculosis of the female genitalia. Fel'd. i akush. 24 no.6:11-14 Je '59. (MIRA 12:8)
(GENERATIVE ORGANS, FEMALE--TUBERCULOSIS)

MARKOV, A.Ya., dotsent (Khar'kov)

Clinical aspects and diagnosis of extrauterine (tubal) pregnancy.
Fel'd. i akush. 24 no.7:13-18 Jl '59. (MIRA 12:10)
(PREGNANCY, EXTRAUTERINE)

MARKOV, A.Ya., kand.med.nauk

Association of uterine cancer with pregnancy [with summary in English]. Akush. i gin. 35 no.1:87-89 Ja-F '59. (MIRA 12:2)

1. Iz akusherako-ginekologicheskoy kliniki (zav. - prof. G.N. Smirnov) Ryazanskogo meditsinskogo instituta imeni akad. I.P. Pavlova.

(PREGNANCY, compl.
cervical cancer, hosp. statist. (Rus))
(CERVIX NEOPLASMS, in pregn.
hosp. statist. (Rus))

MARKOV, A.Ya. (Ryzan')

Treatment of gynecological patients with mud at the "Slavyansk" Health Resort. Kaz. med. zhur. no. 4:92 Jl-Ag '60. (MIRA 13:8)

(SLAVIVANSK—BATHS, MOOR AND MUD)
(GENERATIVE ORGANS, FEMALE—DISEASES)

MARKOV, A.Ya. dotsent, (Khar'kov)

Causes of stillbirth and ways of preventing it. Fel'd. i akush. 25 no.4:22-25 Ap '60. (MIRA 14:5)
(STILLBIRTH)

MARKOV, A. Ya., dots. (Khar'kov)

Causes of and means for reducing newborn mortality. A. IA. Markov.
Kaz. med. zhur. no.1:47-48 Ja-F'61 (MIRA 14:11)

MARKOV, A.Ya., dotsent

Case of a giant fibroma of the ovary. Vop. okhr. mat. i det. 6 no.6:81-82 Je '61. (MIRA 15:7)

1. Iz kafedry akusherstva i ginekologii (zav. dotsent R.I. Malykhina) Ukrainskogo instituta usovershenstvovaniya vrachey (dir. - dotsent I.I. Ovsiyenko).
(OVARIES--TUMORS)

MARKOV, A.Ya., kand.med.nauk (Khar'kov)

Diagnosis of malignant tumors of the ovaries. Zdrav. Bel. 7 no.3: 36-38 Mr '61. (MIRA 14:3)

(OVARIES—CANCER)

MARKOV, A.Ya., dotsent (Khar'kov)

Clinical aspects and diagnosis of acute abdomen in gynecological practice. Fel'd. i akush. 26 no.3:17-21 Mr '61. (MIRA 14:3)
(GENERATIVE ORGANS, FEMALE—DISEASES)

MARKOV, A.Ya., dotsent (Khar'kov)

Acute appendicitis in pregnancy. Fel'd. i akush. 26 no.4:3-6 Ap '61. (MIRA 14:3)

(APPENDICITIS) (PREGNANCY, COMPLICATIONS OF)

MARKOV, A.Ya., dotsent (Khar'kov)

Treatment of fibromyoma of the uterus. Fel'd. i akush. 26 no.7:33-36 Jl '61. (MIRA 14:7)

(UTERUS--TUMORS)

MARKOV, A.Ya., dotsent; GREDITOR, Ye.M., prozektor

Case of arrhenoblastoma of the ovary. Kaz. med. zhur. no.2:72-73 Mr-Ap '62. (MIRA 15:6)

1. Kafedra akusherstva i ginekologii (zav. - doktor med.nauk R.I. Malykhina) Ukrainskogo instituta usovershenstvovaniya vrachey i prozektorskoye otdeleniye 12-y klinicheskoy bol'nitsy Khar'kova (glavnyy vrach - A.I. Kirichenko).
(OVARIES—TUMORS)

MARKOV, A.Ya., dotsent (Khar'kov)

Some characteristics of the course of tumors of the sexual organs in small and adolescent girls. Fel'd. i akush. 27 no.2:12-15 F '62. (MIRA 15:3)
(GENERATIVE ORGANS, FEMALE--TUMORS)
(GIRLS--DISEASES AND HYGIENE)

MARKOV, A.Ya., dotsent; GREDITOR, Ye.M., prozektor

Clinical aspects and pathological anatomy of the Brenner tumor.
Akush. i gin. 39 no.4:116-118 Jl-Ag'63 (MIRA 16:12)

1. Iz kafedry akusherstva i ginekologii Ukrainskogo instituta usovershenstvovaniya vrachey (rektor - dotsent I.I.Ovsiyenko).

ZARAYSKIY, P.K.; ROTT, M.V.; SENYUTA, V.N.; SHUKH, Ya.I.; MARKOV, A.Ye.;
Prinimala uchastiye SHIPULINA, L.A.

Soda-potash method for hydrogen sulfide removal from coke-oven gas. Koks i khim. no.4:40-43 '62. (MIRA 16:8)

1. Rutchenkovskiy koksokhimicheskiy zavod.
(Gases--Purification) (Hydrogen sulfide)

L 18803-65 EWT(d)/EED-2/EWP(1) Po-4/Pq-4/Pg-4/Pk-4 IJP(c)/ASD(a)-5/
RAEM(c)/AFETR/AEDC(a)/ESD(dp)/ESD(t) BB/GG S/2582/64/000/012/0137/0153

ACCESSION NR: AT5000721

AUTHOR: Markov, AL. A. (Gor'kiy) B+1

TITLE: Irregular codes with error corrections

SOURCE: Problemy kibernetiki, no. 12, 1964, 137-153

TOPIC TAGS: parity, error correcting code, binary code, error correction coding, error location coding, error detection coding

ABSTRACT: Binary word coding systems are discussed with regard to error detection and correction. The errors under consideration are of the additive category and not synchronization errors. According to the author's definition, transmissions are words in the alphabet $B = \{b_1, \ldots, b_m\}$ coded according to the coding system $V = \{V_1, \ldots, V_m\}$ in the alphabet $A = \{a_1, \ldots, a_M\}$; $K(\beta)$ is the transform of words in alphabet B into words in alphabet A. The transform consists of substituting each letter $b_i \in B$ $(i = 1, 2, \ldots, m)$ in every entry into the coded message B with the word $v_i \in V$, such that

$$K(b_{i_1} b_{i_2} \ldots b_{i_p}) = v_{i_1} v_{i_2} \ldots v_{i_p}.$$

Card 1/3

The length of the message word α is denoted by $l(\alpha)$, and $\tilde{\alpha}$ denotes the erroneous word. The probability of letter appearance in the alphabet B from the transmission source is the set

$$P(B) = \{p(b_1), p(b_2), \ldots, p(b_m)\},$$

which is normalized to unity. From this set the author defines

$$L(V) = \sum_{i=1}^{m} p(b_i)\, l(v_i),$$

to be a measure of values in the sense of utility of coding the system of words V/ L(V) is used as an optimality criterion for codification systems. Two additional binary vectors are defined for giving error distribution by a bit-matching scheme for equal length words. The "distance" between words $\alpha = a_{i1}\, a_{i2} \ldots a_{ik}$ and $\beta = a_{j1}\, a_{j2} \ldots a_{jk}$ is

$$d(\alpha, \beta) = \sum_{s=1}^{k} \varphi(i_s, j_s),$$

$$\varphi(i, j) = \begin{cases} 1, & \text{if } i \neq j, \\ 0, & \text{if } i = j. \end{cases}$$

L 18803-65
ACCESSION NR: AT5000721

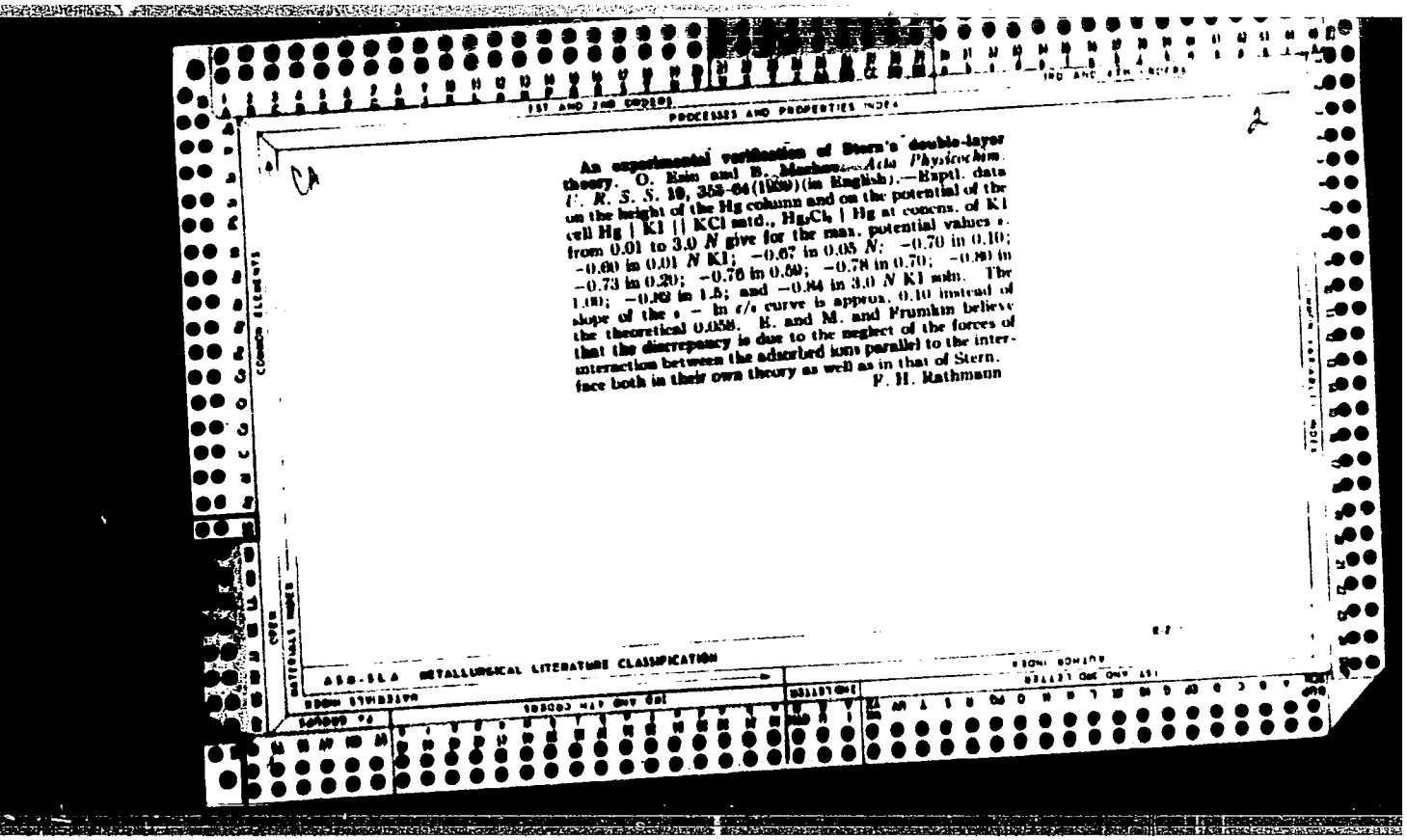
where equal word length is assumed. The distance relationship is instrumental in the author's definition of the order of independence of a word system. A theorem is stated giving the necessary and sufficient conditions for the existence of a decoding automat accomplishing both decoding and error correction for a given class of error distribution and word system. A rigorous structure of rules is developed for defining, for a given word system V, a final oriented weighted graph whose vertices are words in the alphabet A. The determination of the word system's order of independence is predicted upon the nature of succession of the graph vertices. Necessary and sufficient conditions for classifying word systems having the prefix property are stated and proved by utilizing the graph structure. An example is worked out for an irregular word code of three components. Orig. art. has: 100 equations.

ASSOCIATION: none

SUBMITTED: 17Dec62 ENCL: 00

SUB CODE: DP NO REF SOV: 003 OTHER: 002

Card 3/3



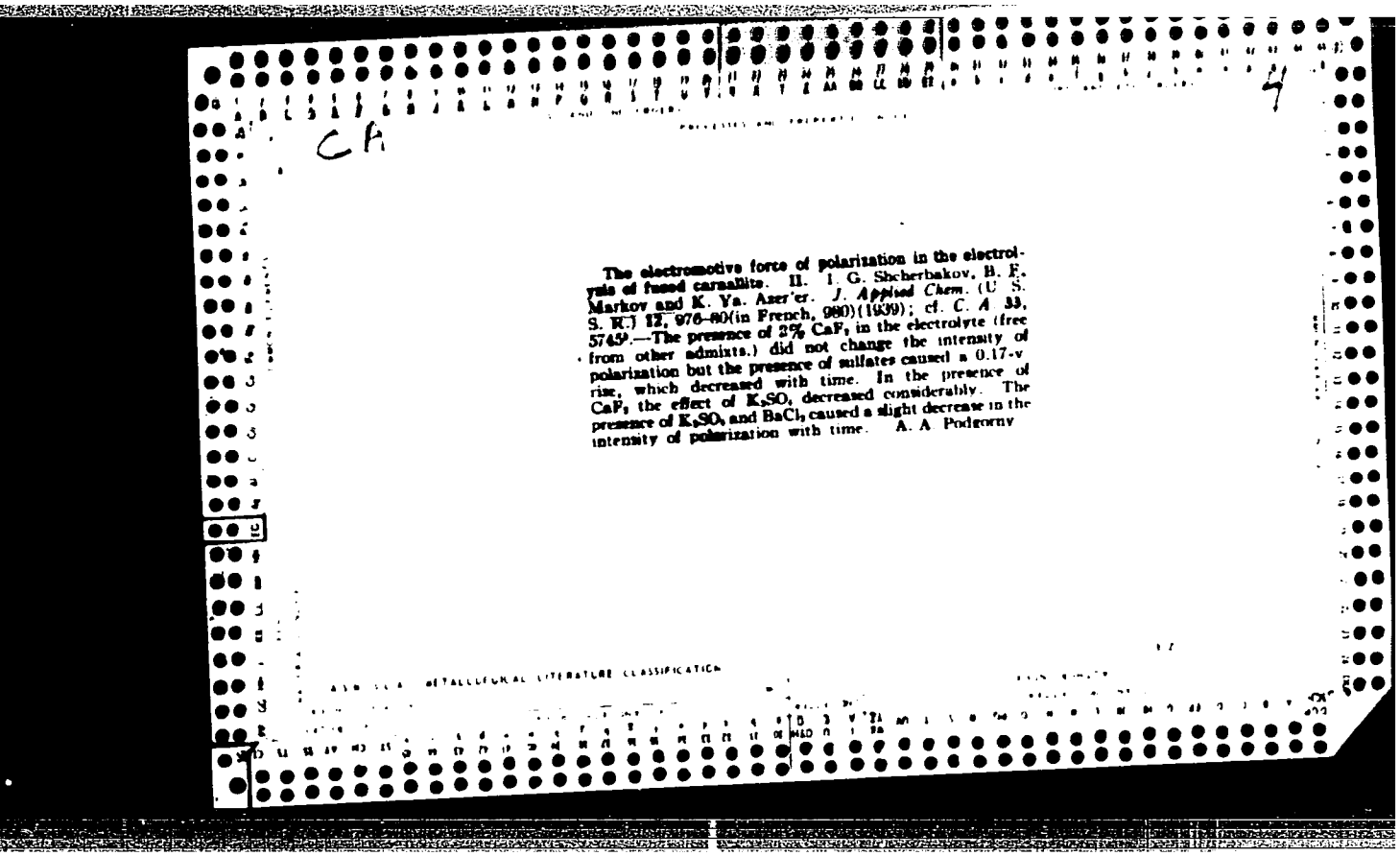
PROCESSES AND PROPERTIES INDEX

CA

2

An experimental verification of Stern's double-layer theory. O. Esin and B. Markov. *Acta Physicochim. U. R. S. S.* 10, 353-64 (1939) (in English).—Rapid. data on the height of the Hg column and on the potential of the cell Hg | KI || KCl satd., Hg_2Cl_2 | Hg at concns. of KI from 0.01 to 3.0 *N* give for the max. potential values ε: −0.60 in 0.01 *N* KI; −0.67 in 0.05 *N*; −0.70 in 0.10; −0.73 in 0.20; −0.76 in 0.50; −0.78 in 0.70; −0.80 in 1.00; −0.82 in 1.5; and −0.84 in 3.0 *N* KI satn. The slope of the ε – ln c/o curve is approx. 0.10 instead of the theoretical 0.058. E. and M. and Frumkin believe that the discrepancy is due to the neglect of the forces of interaction between the adsorbed ions parallel to the interface both in their own theory as well as in that of Stern.
P. H. Rathmann

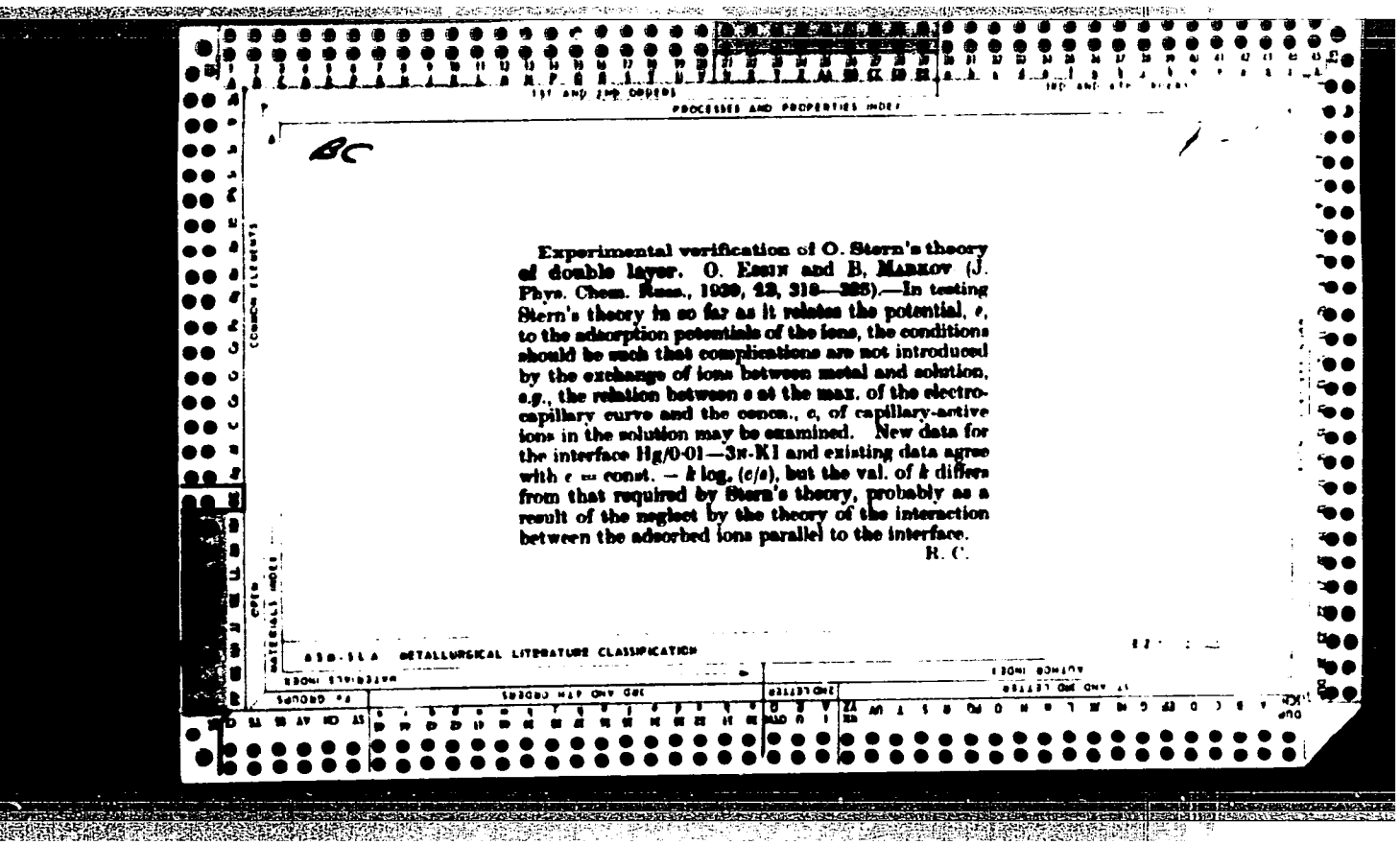
A58-51A METALLURGICAL LITERATURE CLASSIFICATION



CA

4

The electromotive force of polarization in the electrolysis of fused carnallite. II. I. G. Shcherbakov, B. F. Markov and K. Ya. Aser'er. *J. Applied Chem.* (U. S. S. R.) 12, 976–80(in French, 980)(1939); cf. *C. A* 33, 5745⁹.—The presence of 2% CaF_2 in the electrolyte (free from other admixts.) did not change the intensity of polarization but the presence of sulfates caused a 0.17-v. rise, which decreased with time. In the presence of CaF_2 the effect of K_2SO_4 decreased considerably. The presence of K_2SO_4 and $BaCl_2$ caused a slight decrease in the intensity of polarization with time. A. A. Podgorny

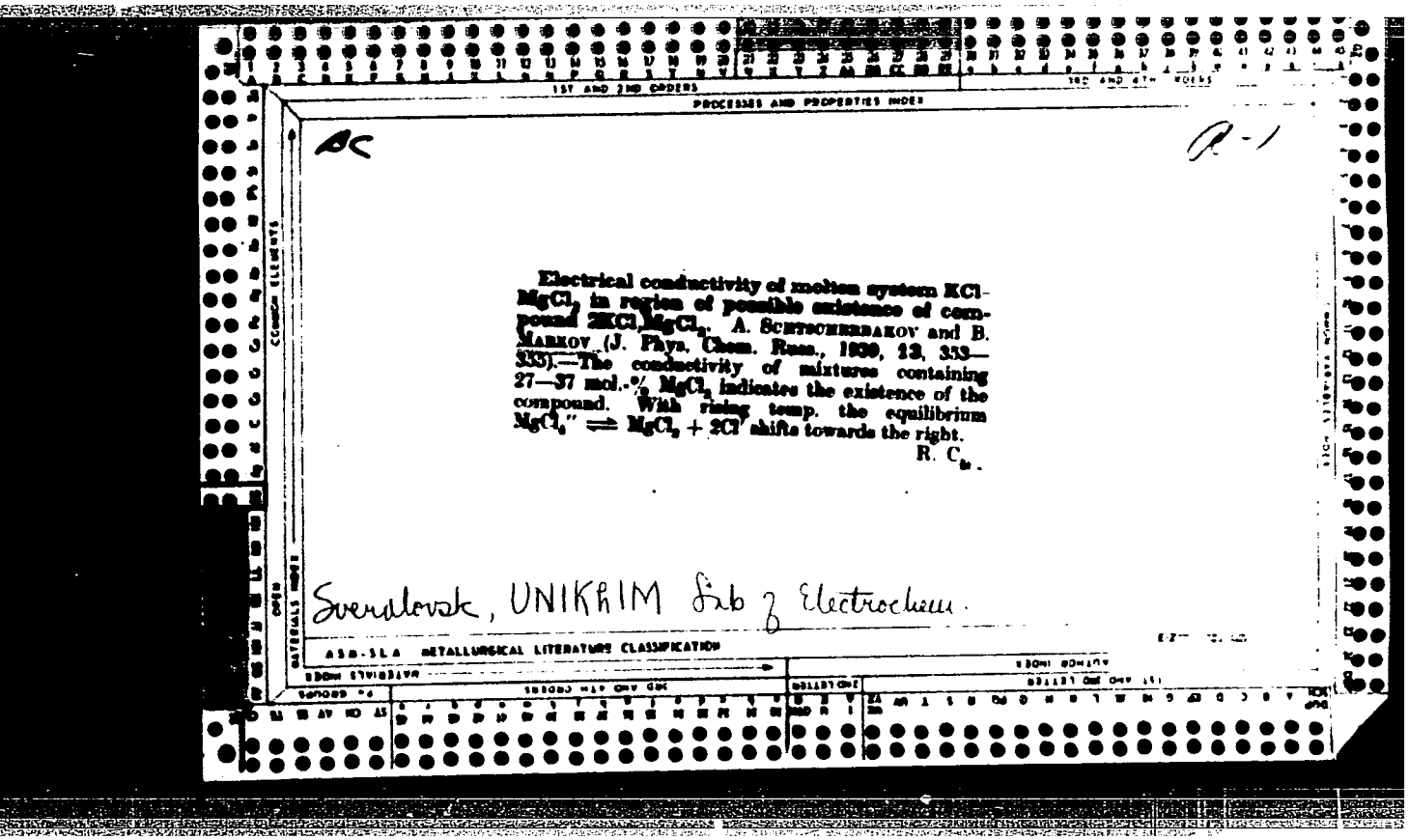


PROCESSES AND PROPERTIES INDEX

BC

Experimental verification of O. Stern's theory of double layer. O. Esin and B. Markov (J. Phys. Chem. Russ., 1939, 13, 318—325).—In testing Stern's theory in so far as it relates the potential, ϵ, to the adsorption potentials of the ions, the conditions should be such that complications are not introduced by the exchange of ions between metal and solution, e.g., the relation between ϵ at the max. of the electrocapillary curve and the concn., c, of capillary-active ions in the solution may be examined. New data for the interface Hg/0·01—3N-KI and existing data agree with $\epsilon = \text{const.} - k \log (c/a)$, but the val. of k differs from that required by Stern's theory, probably as a result of the neglect by the theory of the interaction between the adsorbed ions parallel to the interface.

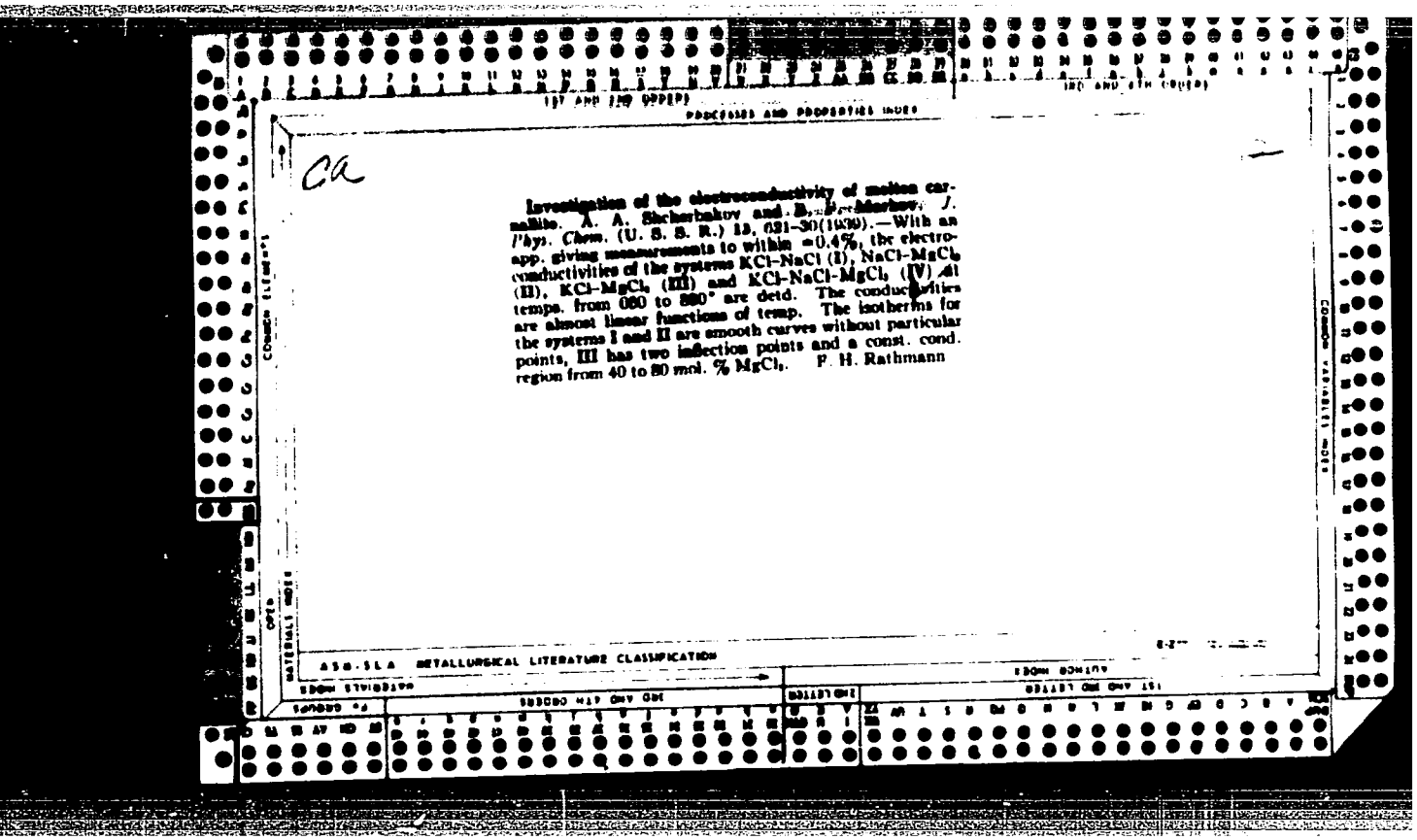
R. C.



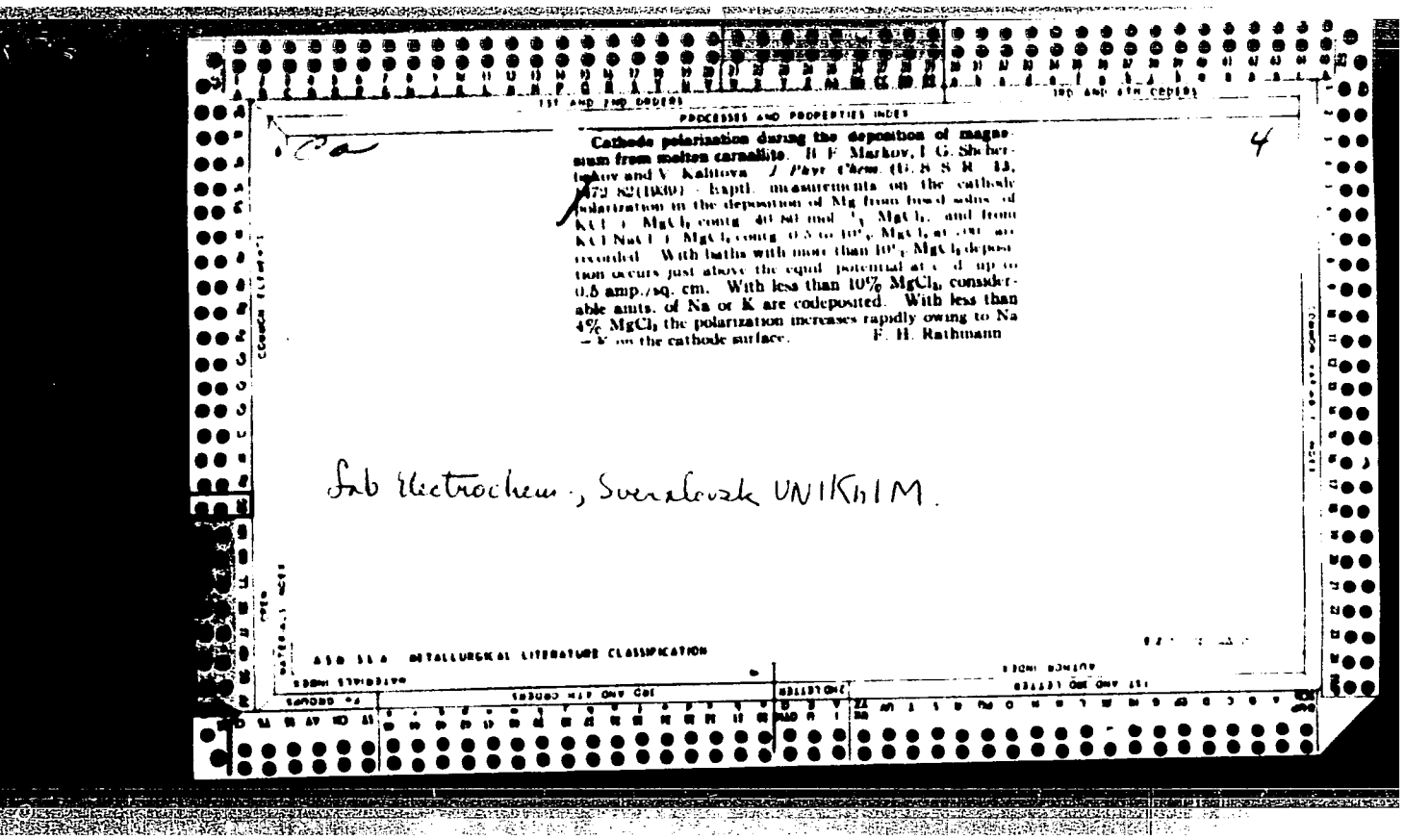
Electrical conductivity of molten system KCl-$MgCl_2$ in region of possible existence of compound $2KCl.MgCl_2$. A. Shchcherbakov and B. Markov (J. Phys. Chem. Russ., 1939, 13, 333—335).—The conductivity of mixtures containing 27—37 mol.-% $MgCl_2$ indicates the existence of the compound. With rising temp. the equilibrium $MgCl_4'' \rightleftharpoons MgCl_2 + 2Cl'$ shifts towards the right.

R. C.

Sverdlovsk, UNIKHIM Lab of Electrochem.



Investigation of the electroconductivity of molten carnallite. A. A. Shcherbakov and B. [illegible]. *J. Phys. Chem.* (U. S. S. R.) 13, 621–30(1939).—With an app. giving measurements to within ±0.4%, the electroconductivities of the systems KCl–NaCl (I), NaCl–$MgCl_2$ (II), KCl–$MgCl_2$ (III) and KCl–NaCl–$MgCl_2$ (IV) at temps. from 660 to 880° are detd. The conductivities are almost linear functions of temp. The isotherms for the systems I and II are smooth curves without particular points, III has two inflection points and a const. cond. region from 40 to 80 mol. % $MgCl_2$. P. H. Rathmann



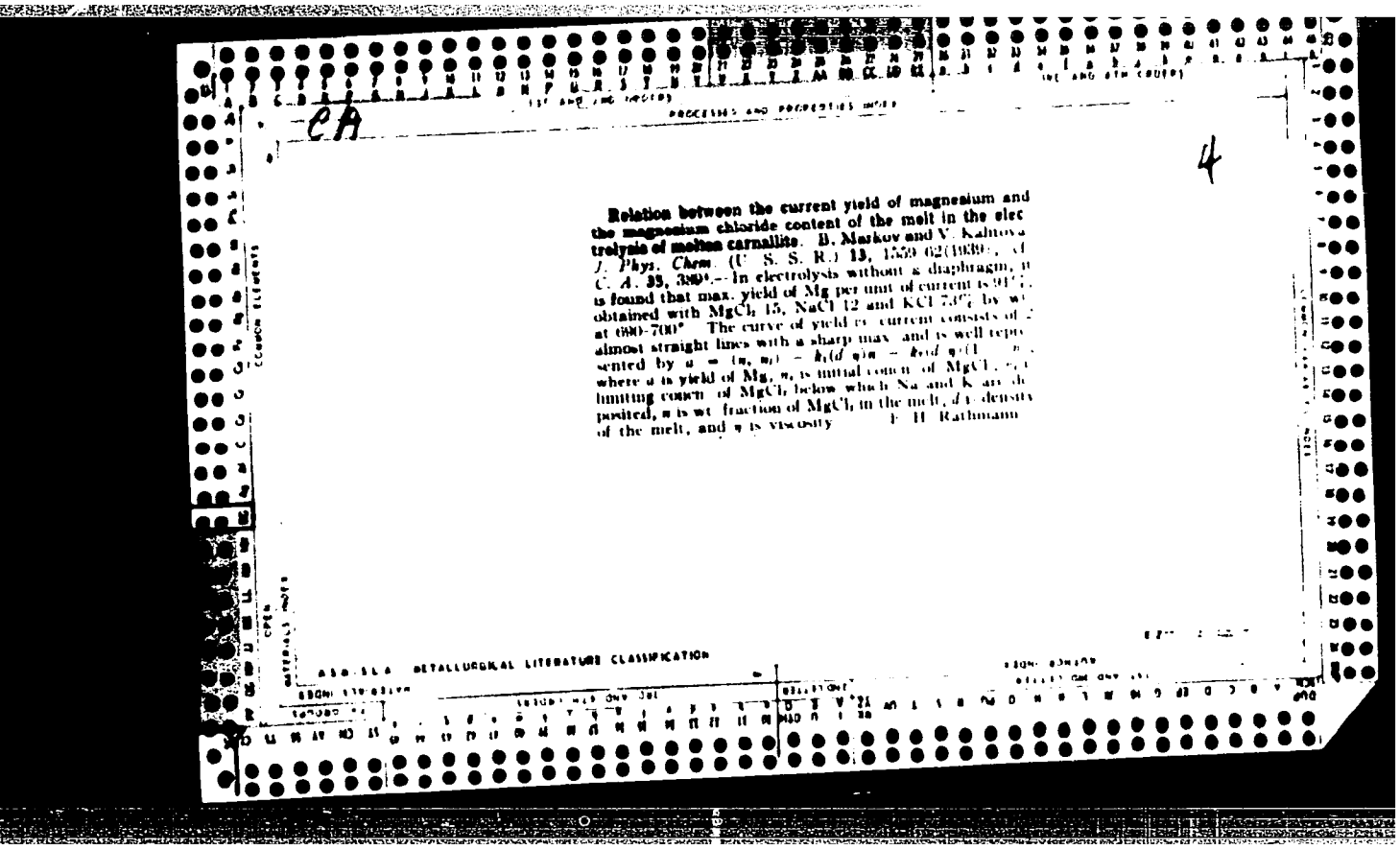
PROCESSES AND PROPERTIES INDEX

4

Cathode polarization during the deposition of magnesium from molten carnallite. B F Markov, I G Shcherbakov and V Kalitova *J Appl Chem (U.S.S.R.)* 13, 1672-82(1940) — Exptl. measurements on the cathodic polarization in the deposition of Mg from fused salts of KCl + $MgCl_2$ contg. 40-50 and 1% $MgCl_2$, and from KCl-NaCl + $MgCl_2$ contg. 0.5 to 10% $MgCl_2$ at 720° are recorded. With baths with more than 10% $MgCl_2$ deposition occurs just above the equil. potential at c.d. up to 0.8 amp./sq. cm. With less than 10% $MgCl_2$ considerable amts. of Na or K are codeposited. With less than 4% $MgCl_2$ the polarization increases rapidly owing to Na + K on the cathode surface. F. H. Rathmann

Lab Electrochem., Sverdlovsk UNIKhIM.

ASD SLA METALLURGICAL LITERATURE CLASSIFICATION



CA

4

Relation between the current yield of magnesium and the magnesium chloride content of the melt in the electrolysis of molten carnallite. B. Markov and V. Kaltova. *J. Phys. Chem.* (U. S. S. R.) **13**, 1559-62(1939).—*C. A.* **35**, 3894.—In electrolysis without a diaphragm, it is found that max. yield of Mg per unit of current is 91% obtained with $MgCl_2$ 15, NaCl 12 and KCl 73% by wt. at 680–700°. The curve of yield vs. current consists of almost straight lines with a sharp max. and is well represented by $a = (n, w) - k(d \cdot \eta/n - k_1 d \cdot \eta/i)$ where a is yield of Mg, n is initial concn. of $MgCl_2$, limiting concn. of $MgCl_2$ below which Na and K are deposited, w is wt. fraction of $MgCl_2$ in the melt, d is density of the melt, and η is viscosity. J. H. Rathmann

MARKOV, B. F.

"Equilibrium Potentials of Magnesium in the Molten Systems M_gCl_2-KCL and M_gCi_2-NaCl,"

SO: Zhur. Fiz. Khim, 23, No. 12, 1949.

Acad. Sci. Ukrainian SSR;

Mbr., Inst. General & Inorganic Chemistry, Dept. Physics-Math. & Chem. Sci., Ukr. Acad. Sci., -c1949-.

MARKOV, B.F.

Electrolytic polarization at low current densities. Ukrain. Khim. Zhur. 16, No.3, 447-56 '50. (MLRA 6:4)
(CA 47 no,22:12062 '53)

1. Inst. Gen. Inorg. Chem., Acad. Sci. Ukr. S.S.R., Kiev.

MARKOV, B.F.

Chemical Abst.
Vol. 48 No. 8
Apr. 25, 1954
Electrochemistry

Polarization of copper during anodic solution in $CuSO_4$-H_2SO_4 solutions. B. F. Markov and V. G. Feshchenko. *Ukrain. Khim. [illegible]* (1951) (in Russian).—Polarization η of Cu in 2*N* $CuSO_4$ + 2 to 0.01*N* H_2SO_4 were detd. as a function of c.d., temp., H_2SO_4 concn., and time. As the temp. increased, η decreased steeply and finally vanished at the b.p. of the electrolyte. This was most pronounced at higher H_2SO_4 concns. Isotherms (18, 25, and 50°) of η *vs.* acid concn. approached linearity. The slopes decreased and became zero at 50°. This was explained by the assumption that H ions were adsorbed on the surface of the anode, forming a layer through which Cu ions passed to enter the soln. This was supported by the electrocapillary characteristics of Hg and by the work of Borisova, *et al.*, (*C.A.* 43, 4701*h*) and Venstrem, *et al.* (*C.A.* 44, 500*i*). The surface tension of electrocapillary max. of Hg in *N* KI, KCNS, KBr, and KCl decreased, in the order given, as the temp. rose to 50°. Log η *vs.* log (c.d.) for 2.0 – 0.01*N* H_2SO_4 were straight lines, and the data were satisfactorily expressed by $\log \eta = \text{const.} + a \log$ (c.d.). Curves of η *vs.* time (cf. Vagramyan, *et al.*, *C.A.* 44, 4803*d*) suggested a slight passivation of the surface at lower H_2SO_4 concn.

I. Bencowitz

USSR/Chemistry - Electrolytic Deposition Feb 51
of Metals

"Joint Deposition of Metals on a Cathode by the Electrolysis of Melts in the Absence of Polarization," F. F. Markov, Inst Gen and Inorg Chem, Acad Sci Ukrainian SSR, Kiev

"Zhur Fiz Khim" Vol XXV, No 2, pp 212-220

Electrolysis of melts of metal salts at high temp in absence of polarization (cd $\approx$ 0) must result in deposition of alloy corr to equil. Since activity of components of melts varies with concn, strictly molar law of mass action does not apply

184T32

USSR/Chemistry - Electrolytic Deposition Feb 51
of Metals (Contd)

in most cases. Plotted equil compn of metal and salt phases, using activity and difference between potentials of 2 metals immersed in their molten salts, for systems: Ag,Pb,AgI,PbI2; Ag, Cu,AgCl,CuCl; K,Na,KOH,NaOH. Also treated syst Pb,Cd,PbCl2,CdCl2.

184T32

MARKOV, B. F.

MARKOV, G. F.

(2)

Chemical Abst.
Vol. 48 No. 6
Mar. 25, 1954
Electrochemistry

The current-potential curves of some successively polarizing electrodes. B. F. Markov and L. V. Markova. *Ukrain. Khim. Zhur.* 18, [illegible] (in Russian).—In the present study of polarography, the principle of brief successive polarization of several electrodes was used, in which the "rest" period of a given electrode enabled it to re-establish the normal ionic environment after polarization. The desired result was achieved by a rotating commutator which made connections to contacts of the various electrodes. The technique was used with Pt-wire electrodes and was applied to reduction of O in 0.1 *N* HCl, to evolution of H, on Pt, and to pptn. of metals (Cd and Hg). It was shown that the app. produced well-defined limiting diffusion-current values of the reducing substances. The high diffusion current of O (60 ma.) permitted a useful method of estn. of O in soln. In examn. of evolution of H from acidic solns. in which the ΔE between 1st and 2nd potentials was about 0.46 v., the appearance of an inflection point in the polarographic curve between these potentials was explained by a considerable rise of concn. of alkali in the boundary layer around the electrode. This explained the relatively high diffusion current without the need of formation of new ionic species.

G. M. Kosolapoff.

Markov, B.F.

CH MG

Cathodic Polarization in the Deposition of Copper from Alcohol Solutions. B. F. Markov (*Trudy Soveshchaniya po Elektrokhimii 1950*, [illegible]—[In Russian]. Polarization curves for soln. of CuCl in water, methanol, ethyl alcohol, and iso-propyl alcohol were determined. The curves were similar in form, but showed differences in the magnitudes of the "initial" polarization and limiting cathodic c.d. The variations in limiting c.d. were attributable to changes in viscosity, to the first approximation. Certain "critical" voltages were also observed, their sequence of magnitude for the various soln. being the same as that for the initial polarization. There is a definite parallel between the structure of the deposits and these characteristic magnitudes. M. concludes that the phys. properties of electrodeposits depend mainly on the conditions which determine the moment of initial deposition.—G. V. F. T.

MARKOV, B. F. and DELIMARSKIY, Yu. K.

"The Problem of the Electrolytic Dissociation of Fused Salts," Ukr. Khim. Zhur., 19, No.3, pp 255-263, 1953. Inst. Gen. & Inorg. Chem.

On the basis of the elec conductivity of fused salts of Be, Mg, Ca, Sr, and Ba at the m p, the degree of dissociation of these salts was estimated. Many physico-chem properties of the fused salts, i.e., the dependence of elec conductivity on temp, the soly of metals in the salt melts, and transfer numbers, confirm the hypothesis of an incomplete dissoc in stages. While the equivalent conductivity drops from LiCl to CsCl, it rises from $MgCl_2$ to $BaCl_2$. 261T16

MARKOV, B.F.

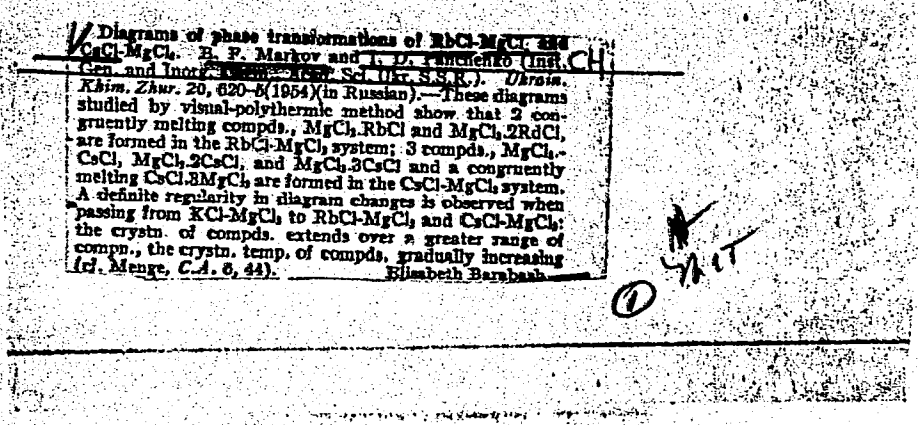
b

Determination of the diffusion coefficient of ions in molten salts. Yu. K. Delimarskii, B. F. Markov, and L. S. Berenblyum (Inst. Gen. Inorg. Chem., Acad. Sci. Ukr. S.S.R., Kiev). *Zhur. Fiz. Khim.* 27, 1848-55(1953).—If a potential (e.g. 0.2 v.) is applied to a large (e.g. Ag) anode and a small (e.g. Pt) cathode immersed in a soln. of a Ag salt in a molten electrolyte, the cathodic c.d. i decreases in time (t) according to $D = \pi t(i/nFc)^2$; D is diffusion coeff. of Ag^+, n is its valency, F faraday, and c concn. of Ag^+. For $AgNO_3$ in an equimol. mixt. of KNO_3 and $NaNO_3$, D was, e.g., at 300° and 400°, 8.4 and 122 at $c = 0.001$ mol./l. and 4 and 11 ($\times 10^{-5}$ sq. cm./sec.) at 0.016 mol./l. For AgCl in the eutectic melt of KCl and LiCl at 450°, D was approx. 8×10^{-5} between $c = 0.003$ and 0.018 but rose at lower c, presumably because of the discharge of other ions besides Ag^+. The above equation was valid also for diffusion in aq. solns. (0.005N $AgNO_3$ + 0.1N KNO_3). When the cathode was spherical, the current intensity was proportional to $[(1/r) + (\pi Dt)^{-1/2}]$; r is the radius of the sphere. This equation was confirmed for aq. solns. of $CdCl_2$ + KCl and of $KClO_3$. An *app.* for continuous measurement of i during several sec. is described.

J. J. Bikerman

11/19/54

Markov, B.F.



V Diagrams of phase transformations of RbCl-$MgCl_2$ and CsCl-$MgCl_2$. B. F. Markov and I. D. Panchenko (Inst. Gen. and Inorg. Chem., Acad. Sci. Ukr. S.S.R.). *Ukrain. Khim. Zhur.* 20, 620–5(1954)(in Russian).—These diagrams studied by visual-polythermic method show that 2 congruently melting compds., $MgCl_2$.RbCl and $MgCl_2$.2RdCl, are formed in the RbCl-$MgCl_2$ system; 3 compds., $MgCl_2$.CsCl, $MgCl_2$.2CsCl, and $MgCl_2$.3CsCl and a congruently melting CsCl.8$MgCl_2$ are formed in the CsCl-$MgCl_2$ system. A definite regularity in diagram changes is observed when passing from KCl-$MgCl_2$ to RbCl-$MgCl_2$ and CsCl-$MgCl_2$: the crystn. of compds. extends over a greater range of compn., the crystn. temp. of compds. gradually increasing (cf. Menge, *C.A.* 6, 44). Elisabeth Barabash

MARKOV, B.F.

USSR/ Chemistry - Physical chemistry

Card 1/1 : Pub. 147 - 16/22

Authors : Markov, B. F.; Delimarskiy, Yu. K.; and Panchenko, I. D.

Title : Thermodynamic properties of $PbCl_2$ in $PbCl_2$-LiCl, $PbCl_2$-NaCl, $PbCl_2$-KCl, $PbCl_2$-RbCl -fusions.

Periodical : Zhur. fiz. khim. 28/11, 1987-1998, November 1954

Abstract : The electromotive forces of chemical chains with mixed electrolytes were measured in relation to temperature and composition of several binary lead chloride and alkali metal fusions. The thermodynamic properties of $PbCl_2$ in solutions with alkali metal chlorides were calculated. It was established, on the basis of thermodynamic data, that $PbCl_2$-LiCl solutions are almost ideal mixtures and that the components forming the solution blend together with the absorption of heat. The free reaction energy of $PbCl_2$ with alkali metal chlorides was determined. Eighteen references: 9-USSR; 6-German and 3-USA (1906-1953). Tables; graphs; drawing.

Institution : Academy of Sciences Ukr-SSR, Institute of General and Inorganic Chemistry

Submitted : March 21, 1954

MARKOV, B. F.

USSR/Chemistry - Inorganic chemistry

Card 1/1 Pub. 116 - 4/25

Authors : Markov, B. F.

Title : Relation between the electromotive forces of chemical chains and the Jacoby-Daniell chains in fusions

Periodical : Ukr. khim. zhur. 21/1, 21-26, 1955

Abstract : The relation between the e.m.f. of the Jacobi-Daniell chain which is composed of metals and their halide salts in melted state and the e.m.f. of corresponding chemical chains is known as the Lorenz law of differences. This law covers only a small group of melted salts having an inherent unipolar anion conductivity. In the case of a compound conductivity the Lorenz law can no longer be maintained. The existence of a liquid potential at the melted salt contact boundary was proven in spite of the existing opinion to the contrary. Seventeen references : 7 USSR, and 10 German (1906-1953).

Institution : Acad. of Sc., Ukr.SSR, Institute of Gen. and Inorg. Chemistry

Submitted : November 14, 1953

MARKOV, B. F.

USSR/ Physical Chemistry - Thermodynamics. Thermochemistry. Equilibrium. Physicochemical analysis. Phase transitions B-8

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11170

Author : Markov B.F.
Title : Thermodynamic Properties of Solutions of Fused Salts

Orig Pub : Ukr. khim. zh.. 1955, 21, No 6, 703-709

Abstract : Text of the paper presented at the 1-st Ukrainian Republic Conference on Physical Chemistry, 17 September 1954. Considered are literature data on solutions of fused salts, secured by the e.m.f. method, and also author's results of investigations of binary systems formed by chlorides of magnesium and lead with chlorides of alkali metals. From e.m.f. of chemical series at different proportions of the components in the melt is calculated the partial molecular isobaric potential $\bar{Z}_1$ of the component of electrochemical reaction, and from dependence of e.m.f. on temperature, the patial molecular entropy $\bar{S}_1$; there are calculated the excess (in comparison with ideal solution) $\bar{Z}_1^E$ and $\bar{S}_1^E$. From comparison of diagrams of state with values of $\bar{Z}_1^E$ it was found that

Card 1/2

USSR/ Physical Chemistry - Thermodynamics. Thermochemistry. Equilibrium. Physicochemical analysis. Phase transitions B-8

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11168

$\bar{Z}_1^E > 0$ only in systems that form solid solutions, $\bar{Z}_1^E = 0$ in eutectic systems (ideal solutions corresponding to Schreder-Le Chatelier equation), $\bar{Z}_1^E < 0$ --in systems involving chemical interaction; the more clearly revealed are chemical compounds on the diagrams, the greater is the negative value of $\bar{Z}_1^E$. A more complete characteristic of a salt melt is derived from conjoint consideration of $\bar{Z}_1^E$ and $\bar{S}_1^E$. On the basis of magnitude and sign of $\bar{Z}_1^E$ and $\bar{S}_1^E$ binary solutions of fused salts can be divided, at first approximation, in 4 groups: $\bar{Z}_1^E \simeq \bar{S}_1^E \simeq 0$ --simplest (ideal) solutions; $\bar{S}_1^E \approx 0$, $\bar{Z}_1^E \neq 0$ --regular solutions; $\bar{S}_1^E > 0$, $\bar{Z}_1^E \gg 0$ --solutions of associated components without chemical interaction; $\bar{S}_1^E > 0$, $\bar{Z}_1^E \leq 0$ --solutions of associated components chemical interaction.

Card 2/2

MARKOV, B.F.; PANCHENKO, I.D.

Equilibrium diagrams of binary systems: magnesium chloride -- alkali metal chlorides. Zhur. ob. khim. 25 no.11:2038-2043 O '55. (MLRA 9:4)

1. Institut obshchey i neorganicheskoy khimii Akademii nauk Ukrainskoy SSR.

(Chlorides)

MARKOV, B.F.

USSR/ Chemistry - Physical chemistry

Card 1/2 Pub. 147 - 7/26

Authors : Markov, B. F.; Delimarskiy, Yu. K.; and Panchenko, I. D.

Title : Thermodynamic properties of $MgCl_2$ in $MgCl_2$-LiCl, $MgCl_2$-NaCl, $MgCl_2$-KCl and $MgCl_2$-RbCl fusions.

Periodical : Zhur. fiz. khim. 29/1, 51-61, Jan 1955

Abstract : The electromotive forces of chemical chains with mixed $Mg/MgCl_2$ electrolytes were measured for various binary liquid systems and the thermodynamic properties of $MgCl_2$ were calculated in solutions with alkali metal chlorides. It was found that $MgCl_2$ and LiCl create solutions close to ideal mixtures. Data are given on the partial isobaric potential of $MgCl_2$ as well as its partial entropy.

Institution : Academy of Sciences Ukr SSR, Institute of General and Inorg. Chem., Kiev.

Submitted : March 20, 1954

Periodical : Zhur. fiz. khim. 29/1, 51-61, Jan 1955

Card 2/2 Pub. 147 - 7/26

Abstract : The thermodynamic properties of $MgCl_2$ in solutions with KCl and RbCl indicated a deep reaction between the individual components which led to the formation of compounds capable of being separated in the solid state. Eight references; 4 USSR; 3 German and 1 Swiss. (1911-1954). Tables; graphs; drawing.

MARKOV, B.F.

Temperature dependence of the electric conductivity of eutectic fused salts. Dokl. AN SSSR 102 no.6:1163-1165 Je'55. (MLRA 8:10)

1. Institut obshchey i neorganicheskoy khimii Akademii nauk USSR. Predstavleno akademikom A.N.Frumkinym
(Salts--Electric properties)

Name: MARKOV, Boris Fedorovich

Dissertation: Study of Properties of Molten Salts by the Method of Electromotive Forces

Degree: Doc Chem Sci

Affiliation: [not indicated]

Defense Date, Place: 14 Jun 56, Joint Council of the Inst of General and Inorganic Chemistry and the Inst of Organic Chemistry, Acad Sci UkSSR

Certification Date: 17 Nov 56

Source: BMVO 6/57

MARKOV, B.F.; PANCHENKO, I.D.; KOSTENKO, T.G.

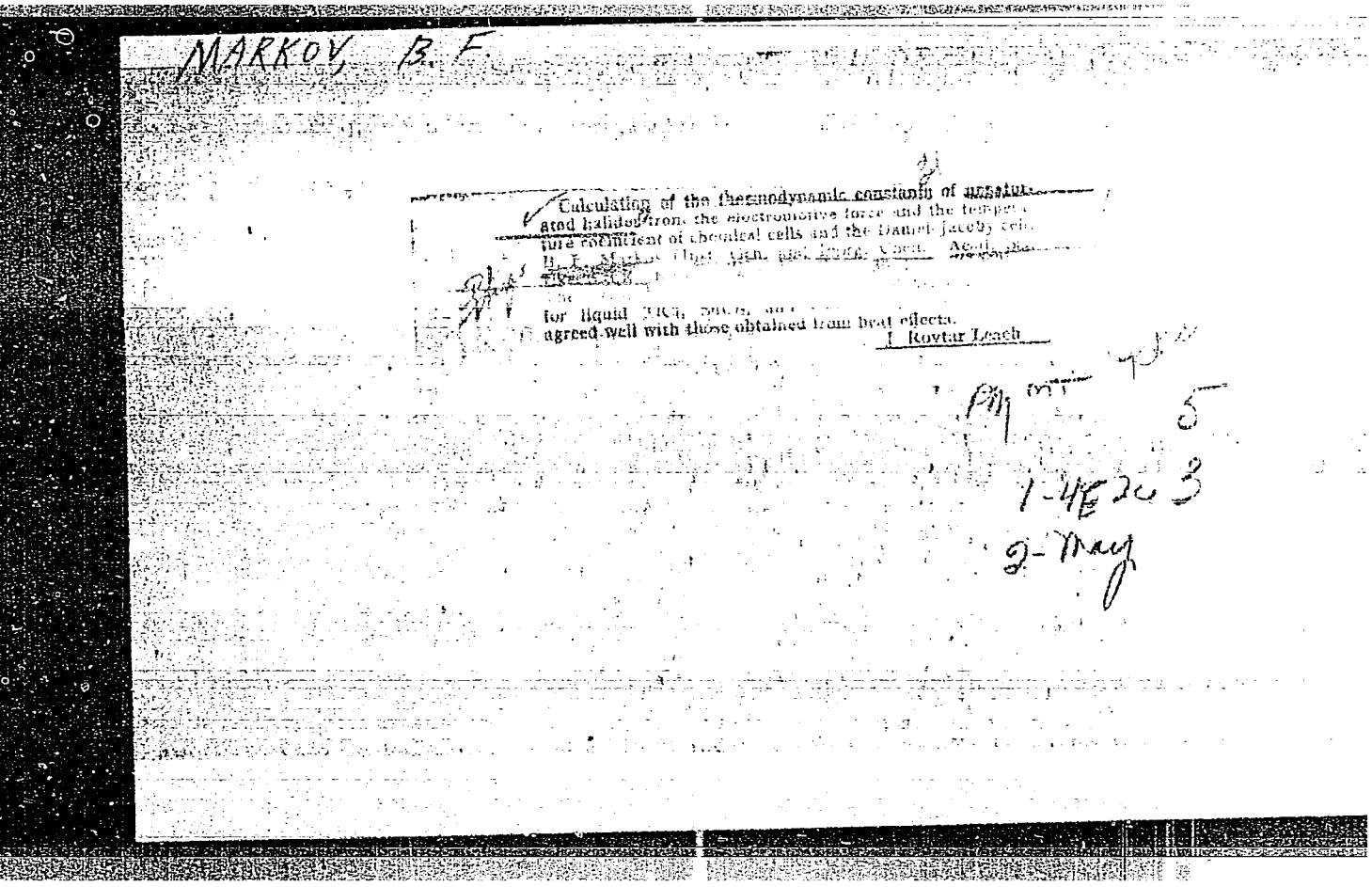
Diagrams of phase transitions for RbCl -- $ZnCl_2$ and CsCl -- $ZnCl_2$. Ukr.khim.zhur. 22 no.3:287-291 '56. (MIRA 9:9)

1.Institut obshey i neorganicheskoy khimii AN USSR.
(Chlorides) (Phase rule and equilibrium)

DELIMARSKIY, Yu.K.; PANCHENKO, I.D.; MARKOV, B.F.

Electrolysis of the system of lead chloride -- lead oxide. Ukr. khim. zhur. 22 no.5:574-577 '56. (MLRA 10:6)

1. Institut obshchey i neorganicheskoy khimii Akademii nauk USSR.
(Electrolysis) (Lead chlorides) (Lead oxides)



MARKOV, B. F.

Calculating of the thermodynamic constants of unstable ... and halides from the electromotive force and the temperature coefficient of chemical cells and the Daniell-Jacoby cell. ... Acad. ...

... for liquid ... agreed well with those obtained from heat effects.

Rovtar Leach

PM MT

5

1-4E203

2-May

Markov, B. F.

0315. THE ELECTROMOTIVE FORCES OF THERMO-CIRCUITS WITH MOLTEN SALTS. B.F.Markov, Dokl. Akad. Nauk SSSR, Vol. 109, No. 1, 113-17 (1956). In Russian. 537.321

These were measured for molten silver halides by themselves as well as mixed with those of alkali metals. The sequence of e.m.f.'s reverses that of solid salts, i.e. it decreases from AgI to AgBr to AgCl. Following Wagner the heterogeneous effect is estimated thermodynamically. For this it suffices to determine the entropy of silver and the molten silver halides at the experimental temperature. The homogeneous effect decreases similarly to the solid case, from AgCl to AgBr to AgI; the absolute temperature coefficients decrease in the same sequence.

J.Jacobs

Markov, B.F.

3790. CONCENTRATION DEPENDENCE OF THE ELECTRICAL CONDUCTIVITY OF BINARY SALT MELTS. B.F. Markov and L.A. Shumina. Dokl. Akad. Nauk SSSR, Vol 110, No. 3, 411-13 (1956). In Russian. 541.133

It is shown from measurements on KCl–NaCl, $PbBr_2$–$PbCl_2$, KCl–LiCl and KNO_3–$NaNO_3$ that the electrical conductivity of binary fused salt systems forming solid solutions can be described by the equation $\lambda_m = x_1^2\lambda_1 + x_2^2\lambda_2 + 2x_1x_2\lambda_{1,2}$, where the λ's are equivalent conductivities, and the x's are mole fractions. However it would be erroneous to suppose that this equation can correctly describe the electrical conductivity variation in the eutectic melts. The departure of the electrical conductivity of these melts from that predicted by this equation can be regarded as a characteristic of their departure from ideality.

R.C. Murray

Inst. Gen. & Inorg. Chem., AS USSR

MARKOV, B. F., PANCHENKO, I. D., and DELIMARSKIY, Y. K., Institute of General and Inorganic Chemistry, AS USSR, Kiev

"Thermodynamic Properties of Certain Chlorides in Melts," a paper submitted at the International Symposium on Macromolecular Chemistry, 9-15 Sep 1957, Prague.

MARKOV B.F

MARKOV, B.F.

Conversion of hydrate forms of salts in solution. Ukr. khim. zhur. 23 no.6:706-712 '57. (MIRA 11:1)

1.Institut obshchey i neorganicheskoy khimii AN USSR.
(Salts) (Solution(Chemistry))

MARKOV, B.F.; SHUMINA, L.A.

The dependence of electric conductivity on the concentration of binary salt fusions [with summary in English]. Zhur.fiz.khim. 31 no.8:1767-1773 Ag '57. (MIRA 10:12)

1. AN USSR, Institut obshchey i neorganicheskoy khimii, Kiyev.
(Salts--Electric properties)

Markov, B. F.

AUTHOR: Markov, B. F. 76-10-17/34

TITLE: The Thermodynamical Properties of Zinc Chloride in $ZnCl_2$-RbCl-Melts (Termodinamicheskiye svoystva khloristogo tsinka v rasplavakh $ZnCl_2$-RbCl).

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 10, pp. 2288-2294 (USSR)

ABSTRACT: It is referred to the former papers of the author in Zhurnal Fizicheskoy Khimii, 1954, Vol. 28, p. 1987 and 1955, Vol. 29, p. 51, as well as in Ukr. khim. Zhurn. 22,287, 1956 and concluded that the thermodynamical properties of the $ZnCl_2$ in melted mixtures of the salts investigated there are typical of systems with chemical interaction and that the particularities found there are bound to repeat here. The electromotive force of the chemical chains in dependence on the temperature and the composition was measured here for the melted double system $ZnCl_2$-RbCl. The thermodynamic properties of $ZnCl_2$ in solutions with rubidium chloride were computed. According

CARD 1/2

The Thermodynamical Properties of Zinc-Chloride in $ZnCl_2$-RbCl-Melts 76-10-17/34

to the thermodynamical properties it can be concluded that 1) according to the partial isobaric potential which was detected in the system by means of the thermic analysis are congruently melting compounds also stable in the melt, and 2) that the growth of the surplus partial potential of $ZnCl_2$ is in line with the temperature, the positive surplus partial entropy and the heat absorption in the dissolution of $ZnVl_2$ in line with the assumption that the individual $ZnCl_2$ is an associated liquid. There are 2 figures, 3 tables, 5 Slavic references.

ASSOCIATION: Institute for General and Inorganic Chemistry, AN Ukrainian SSR Kiyev (Akademiya nauk USSR, Institut obshchey i neorganicheskoy khimii, Kiyev).

SUBMITTED: July 21, 1956

AVAILABLE: Library of Congress

CARD 2/2

AUTHORS: Markov, B.F., Delimarskiy, Yu.K. 76-11-34/35

TITLE: The Thermodynamic Properties of $BeCl_2$ in the $BeCl_2$-NaCl Molten System (Termodinamicheskiye svoystva $BeCl_2$ v rasplavlennoy sisteme $BeCl_2$-NaCl)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 11, pp. 2589-2590 (USSR)

ABSTRACT: One of the methods of investigating salt solutions in a molten state consists in measuring the electromotoric force (EMF) of galvanic elements with mixed electrolytes. This method was employed in this case. The EMF of the chemical chains $Be\,|BeCl_2x_1+NaCl(1-x_1)|\,Cl_2$ were measured in dependence on the mol part of the $BeCl_2$. The EMF of the chemical chain with the individual $BeCl_2$ was found by means of the experimental amounts and was determined as being equal to 1.986 V at 500°. The partial thermodynamic properties of $BeCl_2$ are computed. The energy on the occasion of the formation $BeCl_2.2NaCl$ in the melt at 500° amounted to 7.5 kcal. There are 1 figure, 2 tables, and 4 references, 3 of which are Slavic.

Card 1/2

The Thermodynamic Properties of $BeCl_2$ in the $BeCl_2$-NaCl Molten System

76-11-34/35

ASSOCIATION: AN Ukrainian SSR, Institute for General and Inorganic Chemistry (Akademiya nauk USSR. Institut obshchey i neorganicheskoy khimii)

SUBMITTED: December 10, 1956

AVAILABLE: Library of Congress

Card 2/2

MARKOV, B.F.; CHERNOV, R.V.

Phase diagrams of binary salt systems. Part 3: $RbCl-MnCl_2$ and $CsCl-MnCl_2$. Ukr. khim. zhur. 24 no. 2:139-142 '58. (MIRA 11:6)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
(Rubidium chloride)
(Cesium chloride)
(Manganese chlorides)

MARKOV, B.F.; CHERNOV, R.V.

Phase diagrams of binary salt systems. Part 4: $RbCl-SnCl_2$ and $CsCl-SnSl_2$. Ukr. khim. zhur. 24 no. 2:143-145 '58. (MIRA 11:6)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
(Rubidium chloride)
(Cesium chloride)
(Tin chlorides)

MARKOV, B.F.; GITMAN, Ya.B.

Simultaneous deposition of metals during electrolysis of fused salts with concentration polarization. Ukr.khim.zhur. 24 no.5:581-584 '58. (MIRA 12:1)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
(Alloys) (Electroplating)

AUTHOR: Markov, B. F. 76-32-2-38/38

TITLE: The Temperature Dependence of the Electromotive Forces of Chemical Chains With Molten Salts
(O temperaturnoy zavisimosti elektrodvizhushchikh sil khimicheskikh tsepey s rasplavlennymi solyami)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 2, pp. 476-477 (USSR).

ABSTRACT: This is a letter to the editor in connection with L. Suskiy's article (reference 1). A strongly marked in-constancy of the temperature coefficient of electromotive force (emf) was observed by L. Suskiy in the measurement of the emf of the chemical chain of molten lead, leadchloride and a chlorine electrode (reference 1). The writer shows that the final conclusions drawn from the experiments, why other researchers had obtained a linear change of emf with temperature, are wrong. It is shown that the experimental results of Suskiy contradict thermodynamic calculation. Why the experimental data of Suskiy do not agree with the demands of the theory is hard to explain.
There are 7 references, 6 of which are Soviet.

Card 1/2

The Temperature Dependence of the Electromotive Forces of Chemical Chains With Molten Salts 76-32-2-38/38

ASSOCIATION: Institute of General and Inorganic Chemistry, AS Ukrainian SSR, Kiyev
(Akademiya nauk USSR, Institut obshchey i neorganicheskoy khimii, Kiyev).

SUBMITTED: January 3, 1957.

1. Electrochemistry 2 Electric potential--Temperature factors

Card 2/2

USCOMM-DC-60215

AUTHORS: Markov, B. F., Tarasenko, A. M. SOV 76-32-6-22/46

TITLE: The Temperature Dependence of the Electroconductivity of Binary Salt Melts in Connection With Their Phase Diagrams (O temperaturnoy zavisimosti elektroprovodnosti binarnykh solevykh rasplavov v svyazi s fazovymi diagrammami)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 6, pp 1333 - 1340 (USSR)

ABSTRACT: It was already found in a previous paper that in cooling molten salt eutectics below the melting temperature of the components a quasieutectic structure is formed. This is, however, not the case in salt melts forming a continuous series of solid solutions in crystallization; on the other hand the heterogeneity of the solid phase also shows in the liquid by which fact microheterogeneities occur near the crystallization temperature of the eutectic mixture. V.I.Danilov and I.V.Radchenko (Ref 2) already carried out such studies. The authors proceed from the assumption that the structural changes in the melt can be recognized in the electroconductivity. The authors use the theoretically founded equation by Ya.I.Frenkel' (Ref 3) $\lg \kappa = A - B/T$ for the analysis

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of the experimental data; from the experimental part may be seen that a sound generator ЗГ-10 and a zero indicator of the oscillograph typ ЭНО -3 were used as well as a Pt-Pt/Rh thermocouple graded by the All Union Scientific Research Institute of Meteorology imeni D.I.Mendeleyev. Measurements of three binary salt melt types were carried out: 1) Simple eutectic mixtures. 2) The continuous series of solid solutions, and 3) The intermediate type between the former two. It was observed that in the second case the above mentioned equation was valid within the whole temperature interval. This is taken as proof for the fact that no structural changes occur with temperature changes. For the first type the equation holds only for the temperature interval above the melting temperature of the components. Below that point till the crystallization temperature of the eutectic mixture the electroconductivity changes according to another rule. This is explained by an overcrystallization and by the formation of micro-areas enriched by one of the two components. The third, socalled intermediate, type can be classified according to the degree of its deviation from the linear function, i.e. to which of the other two systems it is nearer The

The Temperature Dependence of the Electroconductivity 76-32-6-22/46
of Binary Salt Melts in Connection With Their Phase Diagrams

corresponding systems of binary salt mixtures for the mentioned types of salt melts are mentioned as well as the diagrams obtained. There are 13 figures and 9 references, 7 of which are Soviet.

ASSOCIATION: Akademiya nauk USSR, Institut obshchey i neorganicheskoy khimii, Kiyev (Kiyev, Institute of General and Inorganic Chemistry, AS Ukr SSR)

1. Salts (Liquid)--Conductivity 2. Salts (Liquid)--Temperature factors 3. Salts (Liquid)--Phase studies 4. Eutectics--Properties

Card 3/3

MARKOV, B.F.

5(1,4) PHASE I BOOK EXPLOITATION SOV/3813

Akademiya nauk Ukrainskoy SSR. Institut obshchey i neorganicheskoy khimii

Raboty po khimii rastvorov i kompleksnykh soyedineniy, vyp. 2 (Papers on the Chemistry of Solutions and Complex Compounds, Nr 2) Kiyev, 1959. 229 p. Errata slip inserted. 2,000 copies printed.

Resp. Ed.: Ya.A. Fialkov (Deceased) Corresponding Member, Ukrainian SSR, Academy of Sciences; Ed. of Publishing House: Z.S. Pokrovskaya; Tech. Ed.: M.I. Yefimova.

PURPOSE: This book is intended for research scientists, teachers in schools of higher education and technical schools, aspirants, and students of advanced chemistry courses.

COVERAGE: The collection contains 9 articles which review work conducted at the Institute for General and Inorganic Chemistry, Ukrainian Academy of Sciences, on electrolytic aqueous and nonaqueous solutions, the chemistry of complex compounds,

AVAILABLE: Library of Congress

Card 3/3 TM/mas 3-30-60

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MARKOV B F

PHASE I BOOK EXPLOITATION SOV/2214

5(4)

Soveshchaniye po elektrokhimii. 4th, Moscow, 1956.

Trudy ... [sbornik] (Transactions of the Fourth Conference on Electrochemistry; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.

Editorial Board: A.N. Frumkin (Resp. Ed.) Academician, O.A. Yesin, Professor, S.I. Zhdanov (Resp. Secretary), B.N. Kabanov, Professor, S.I. Zhdanov (Resp. Secretary), B.N. Kabanov, Professor, Ya. M. Kolotyrkin, Doctor of Chemical Sciences, V.V. Losev, P.D. Lukovtsev, Professor, Z.A. Solov'yeva, V.V. Stender, Professor, and O.M. Florianovich, Ed. of Publishing House; N.G. Yegorova; Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry.

COVERAGE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and in metal electrodeposition and industrial electrolysis. Abridged discussions are given at the end of each division. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

MARKOV, B.F.

Electromotive forces of chemical cells consisting of single fused salts. Rab.po khim.rastv.i kompl.soed. no.2:216-230 '59. (MIRA 13:4)

(Salts) (Electromotive force)

MARKOV, B F

PHASE I BOOK EXPLOITATION SOV/5047

Delimarskiy, Yuriy Konstantinovich, and Boris Fedorovich Markov

Elektrokhimiya rasplavlennykh soley (Electrochemistry of Fused Salts) Moscow, Metallurgizdat, 1960. 325 p. Errata slip inserted. 3,700 copies printed

Ed.: A.I. Belyayev; Ed. of Publishing House: L.M. El'kind; Tech. Ed.: V.V. Mikhaylova.

PURPOSE: This book is intended for aspirants, scientists, and technical personnel in the field of electrochemistry, and for students in schools of higher education.

COVERAGE: The book discusses the following fundamentals of the electrochemistry of fused salts: conductance and ion migration, galvanic cells, decomposition and electrode potentials, the solubility of metals and metal - fused salt equilibrium, electrolysis and polarization, electrode reactions, and the polarography of fused salts. Recent experimental and theoretical investigations of the electrochemistry of fused salts are reviewed. The modern concepts of the liquid state as an ordered system and of the close structural correspondence of the liquid to the solid

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Electrochemistry of Fused Salts SOV/5047

phase are extensively used. The introduction and Chs. III, IV, V, and VIII were written by Yu.K. Delimarskiy and Chs. I, II, VI, and VII by B.F. Markov. The authors thank V.P. Mashovets, Professor, Doctor, and A.I. Belyayev, Professor, Doctor, for their advice. References accompany each chapter.

TABLE OF CONTENTS:

Card 2/9

Electrochemistry of Fused Salts

KUL'SKIY, Leonid Adol'fovich, prof.; MARKOV, B.F., doktor khim.nauk, otv.red.; KIRICHENKO, O.I., inzh., otv.red.; SHEVCHENKO, M.A., kand.khim.nauk, red.; GORONOVSKIY, I.T., kand.khim.nauk, red.; NAKORCHEVSKAYA, V.F., inzh., red.; SLIPCHENKO, V.A., inzh., red.; SOKOLOVSKIY, L.I., red.izd-va; YEFIMOVA, M.I., tekhn.red.

[Chemistry and technology of water treatment] Khimiia i tekhnologiia obrabotki vody. Kiev, Izd-vo Akad.nauk USSR, 1960. 359 p. (MIRA 13:7)
(Water--Purification)

MARKOV, B.F.; TUMANOVA, N.Kh.

Study of the transformations of salts in hydrate form in solution by the method of electric conductivity. Zhur. fiz.khim. 34 no.7:1534-1542 Jl '60. (MIRA 13:7)

1. Akademiya nauk USSR, Institut obshchey i neorganicheskoy khimii.
(Salts) (Hydrates)

MARKOV, B.F.; VOYTOVICH, B.A.; VARABANOVA, A.S.

Behavior of phosphorus oxychloride toward $TiCl_4$, CCl_4, $SiCl_4$, $GeCl_4$, and $SnCl_4$. Zhur.neorg.khim. 6 no.5:1204-1210 My '61. (MIRA 14:4)

1. Institut obshchey i neorganicheskoy khimii AN USSR.

(Chlorides) (Phosphoryl chloride)

MARKOV, B.F., CHERNOV, R.V.

Phase diagrams of binary salt systems. Part 6: Applications of the Schröder equation. Ukr. khim. zhur. 27 no.1:34-39 '61.
(MIRA 14:2)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
(Systems (Chemistry)) (Chlorides)

S/073/61/027/[illegible]/[illegible]
B103/B216

AUTHORS: Markov, B. F., Gitman, Ye. B., and Belyakova, Ye. P

TITLE: Electrolysis of titanium tetrachloride in fused salts
Stepwise cathodic reduction

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 27, no. 1, 1961, [illegible]

TEXT: The authors applied several methods to investigate the cathodic reduction of $TiCl_4$, $TiCl_3$ and $TiCl_2$ in fused salts (KCl - NaCl), i.e by taking the current voltage curves, 1 b) by recording the same curves in the ЭПП-09 (EPP-09) recording potentiometer, 2) electrolysis by controlled potential and 3) emf measurement of voltaic cells. Electrolysis under these conditions involves various processes: a) $TiCl_4$ may be reduced to $TiCl_3$ and $TiCl_2$, which dissolve in the electrolyte melt with formation of a complex compound; b) apart from electrochemical processes, the reduction products of $TiCl_4$ react chemically with each other. The following heterogeneous equilibriums must be taken into account: $2TiCl_3$ (melt) [illegible]

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S/073/61/027/ [illegible]
B103/B216

Electrolysis of titanium..

(solid) $\rightleftharpoons$ $2TiCl_2$ (melt) and $TiCl_2$ (melt) + $TiCl_4$ $\rightleftharpoons$ $2TiCl_3$ [illegible]

have partially been studied previously by other researchers. To 1a): The authors passed $TiCl_4$ vapor mixed with argon over the KCl-NaCl melts in electrolyzers of various designs. Fig. 1 represents a typical curve with reduction potentials at 720°C, i.e. I, slightly above 1 v; II, approximately 2 v and III, approximately 3 v. III corresponds to background reduction, namely reduction of sodium ion. At potential II titanium chlorides are reduced to metal. Potential I corresponds to the reduction of $TiCl_4$ to $TiCl_2$. To 1b): A cell with separate electrode compartments was used applying a silver anode with an anolyte containing silver chloride. The authors draw the following conclusions from the series performed: Two reduction potentials were observed during catholic reduction of a mixture of chlorides of di- and trivalent titanium, the lower one being the reduction potential of the system Ti^{+2}/Ti^{+3}, and the higher one the potential corresponding to reduction of $TiCl_4$ to metal. To 2): $TiCl_4$ was electrolyzed between graphite and tungsten electrodes

Card 2/5

Electrolysis of titanium...

separated by a diaphragm. A controlled potential was applied to the electrodes. Fig. 2 shows the results from which it is apparent that $TiCl_4$ is reduced mainly to $TiCl_2$ after electrolysis for 6-8 hr at a constant low voltage (1.2-1.4 v). At a voltage of 2.2-2.4 v, the titanium in the melt is mainly in the Ti^{3+} form. Cathodic reduction of titanium chloride to metal sets in at 1.9 v. To 3): The authors studied the behavior of a KCl - NaCl melt containing $TiCl_2$ and $TiCl_3$ at 700°C in order to determine the redox potential, measuring the emf of the cell Pt|Ti^{2+}, Ti^{3+}, KCl—NaCl| diaphragm|KCl— NaCl, AgCl|Ag. The redox potentials obtained in this manner were reduced to the potential of a chlorine electrode by adding the emf value (from published data) of the cell Ag|AgCl, KCl—NaCl|Cl_2 to the measured values. The authors mention publications by M. V. Kamenetskiy and M. V. Smirnov. There are 5 figures, 1 table, and 21 references: 8 Soviet-bloc and 13 non-Soviet-bloc. The 2 references to English language publications read as follows: M. B. Alpert et al., J. Electrochem. Soc., 104, 555 (1957) and 106, 142 (1959), Ref. 18.

Card 3/5

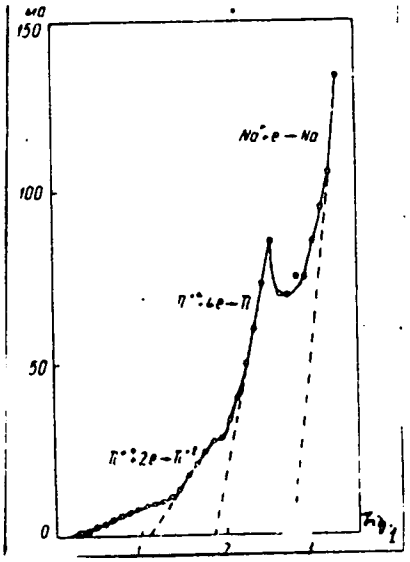
S/073/61/027/001/001/002
B103/B216

Electrolysis of titanium...

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN USSR
(Institute of General and Inorganic Chemistry, UkrSSR)

SUBMITTED: June 26, 1959

Legend to Fig. 1: Current voltage curve at 720°C: abscissa - volts.



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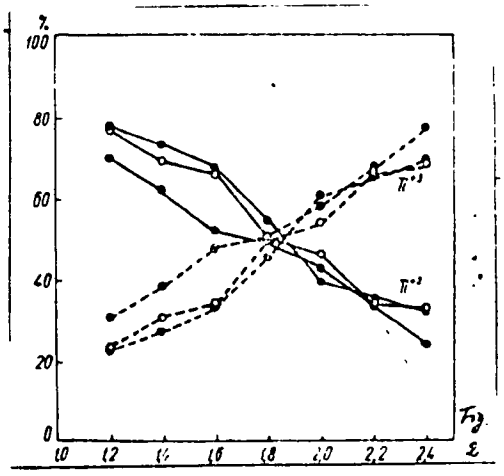
B/101/B216

Legend to Fig. 2: The composition of the reaction products of $TiCl_4$ as a function of the voltage during electrolysis. Blank circle - KCl-NaCl, black circle - $MgCl_2$, both at 780°C, circle with cross: NaCl — $CaCl_2$ — $BaCl_2$ at 700°C, abscissae - volts.



S/073/61/027/002/001/...4
B101/B208

AUTHORS: Markov, B. F. and Belyakova, Ye. P.

TITLE: Equilibrium between the products of electrolytic reduction of titanium tetrachloride

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 27, no. 2, 1961, 146-151

TEXT: In the electrolysis of $TiCl_4$ in molten chlorides, $TiCl_4$ is gradually reduced to bivalent and trivalent titanium compounds before the metallic titanium is separated. The purpose of the present study was to determine the equilibria of these steps in various melts: 1) equimolecular mixture of NaCl and KCl; 2) eutectic mixture of $CaCl_2$, $BaCl_2$, and NaCl; 3) $MgCl_2$; and 4) CsCl. The melt containing an admixture of pure titanium metal and $TiCl_4$ was protected from oxidation by argon. $TiCl_2$ and $TiCl_3$ were obtained by electrolysis of the melt at 1.8 v in quartz ampuls. The melt was heated at 720°C for 3.5-4 hr. Then, samples were taken from the melt in a CO_2 atmosphere. In one portion of the sample, the suspended $TiCl_2$ was filtered, and $TiCl_3$ titrated with $KMnO_4$. The other portion was mixed with iron ammonium

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sulfate acidified with H_2SO_4, and the resultant Fe^{2+} equivalent to the oxidation of Ti^{2+} and Ti^{3+} was titrated. The equilibria obtained for the individual melts are presented in Tables 1-4. It may be seen therefrom that the ratio between the lower titanium chlorides depends on the medium of the melt. This is indicated in Table 5, and compared with data obtained by other research workers. These equilibria are established in the electrolyte layer adjacent to the titanium metal. There is another equilibrium at the interface electrolyte - $TiCl_4$ vapor. This was studied at 780°C with an equimolar KCl-NaCl melt prepared in an argon atmosphere, which contained $TiCl_2$, and through which $TiCl_4$ vapor was bubbled for 3.5 hr. It was found in preliminary experiments that equilibrium is established already after two hr. Results are given in Table 6:

Initial ratio $[Ti^{2+}/(Ti^{2+}+Ti^{3+})]\cdot 100\%$	Total Ti content in the melt, wt%	Equilibrium ratio $[Ti^{2+}/(Ti^{2+}+Ti^{3+})]\cdot 100\%$	Number of analyses
92	1.21	35.5	4
90	2.52	36.5	3
92	4.83	37.9	4
100	20.58	40.3	4

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It may be seen from the equilibrium constants K_1 and K_2 in Tables 1-4 that a satisfactory constancy (K_2) is obtained if the molar portion of bivalent titanium is calculated as Ti_2Cl_4. There are 6 tables and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The 2 references to English-language publications read as follows: 1) S. Mellgren, W. Opie, J. Metals, 2, 266 (1957); 2) W. Kreye, H. Kellog, J. Electroch. Soc., 104, no. 8, (1957).

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN USSR (Institute of General and Inorganic Chemistry, AS UkrSSR)

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Table 1. Equilibrium between $TiCl_2$, $TiCl_3$, and Ti in KCl-NaCl melt at 720°C.

Legend: 1) Total Ti content of the melt; 2) equilibrium ratio; 3) equilibrium constant.

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Table 1

(1) Общее содержание титана в расплаве, вес. %	(2) Равновесное отношение $\frac{Ti^{2+}}{Ti^{2+}+Ti^{3+}}\cdot 100\%$	(3) Константа равновесия $\times 10^3$ $2TiCl_3+Ti \rightleftarrows 3TiCl_2$ $K_1=\frac{N^2_{TiCl_2}}{N^3_{TiCl_3}}$	$2TiCl_3+Ti \rightleftarrows {}^3/_2Ti_2Cl_4$ $K_2=\frac{N^2_{TiCl_3}}{N^{3/2}_{Ti_2Cl_4}}$
1,06	80,18	5,96	0,665
1,09	80,00	5,81	0,632
1,22	80,33	4,38	0,608
1,52	82,89	2,59	0,512
3,32	88,55	0,40	0,282
3,66	88,76	0,36	0,32
3,83	89,55	0,31	0,303
4,70	90,42	0,29	0,254

Table 2

(4) Общее содержание титана в расплаве, вес. %	(2) Равновесное отношение $\frac{Ti^{2+}}{Ti^{2+}+Ti^{3+}}\cdot 100\%$	(5) Константа равновесия $\times 10^3$ $2TiCl_3+Ti \rightleftarrows 3TiCl_2$ $K_1=\frac{N^2_{TiCl_2}}{N^3_{TiCl_3}}$	$2TiCl_3+Ti \rightleftarrows {}^3/_2Ti_2Cl_4$ $K_2=\frac{N^2_{TiCl_2}}{N^{3/2}_{Ti_2Cl_4}}$
0,10	60,00	0,337	1,45
0,48	62,50	0,061	2,61
0,91	67,03	0,018	2,51

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Table 2. Equilibrium between $TiCl_2$, $TiCl_3$, and Ti in $CaCl_2$-$BaCl_2$-NaCl at 720°C.
Legend as in Table 1.

(1) Общее содержание титана в расплаве, вес. %	(2) Равновесное отношение $\frac{Ti^{2+}}{Ti^{2+}+Ti^{3+}}\cdot 100\%$	(3) Константа равновесия × 10^3 $2TiCl_3 + Ti \rightleftarrows 3TiCl_2$ $K_1=\frac{N^2_{TiCl_2}}{N^3_{TiCl_3}}$	$2TiCl_3 + Ti \rightleftarrows {}^3/_2Ti_2Cl_4$ $K_2=\frac{N^2_{TiCl_2}}{N^3/_2_{Ti_2Cl_4}}$
0,13	46,15	1,14	4,2
0,12	45,55	0,51	4,0
0,15	48,27	0,29	4,2!
0,17	48,48	0,31	5,09
0,18	48,56	0,29	5,20
0,24	50,00	0,21	5,21

Table 3. Equilibrium between $TiCl_2$, $TiCl_3$, and Ti in $MgCl_2$ melt at 760°C.
Legend as in Table 1.

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① Общее содержание титана в расп ве, вес. %	② Равновесное отношение $\frac{Ti^{2+}}{Ti^{2+}+Ti^{3+}}\cdot 100\%$	③ Константа равновесия $\times 10^3$ $2TiCl_3+Ti\rightleftarrows 3TiCl_2$ $K_1=\frac{N^2_{TiCl_2}}{N^3_{TiCl_3}}$	$2TiCl_3+Ti\rightleftarrows {}^3/_2Ti_2Cl_4$ $K_2=\frac{N^2_{TiCl_2}}{N^{3/2}_{Ti_2Cl_4}}$
0,46	63,04	31,6	3,10
1,20	66,66	8,9	3,74
1,48	70,03	4,9	3,00
1,75	71,42	3,7	3,01
2,39	72,80	1,9	2,99

Table 4. Equilibrium between $TiCl_2$, $TiCl_3$, and Ti in CsCl melt at 720°C. Legend as in Table 1.

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① Расплавленная среда	② Температура, °C	③ Общее содержание титана в расп ave, вес. %	④ Равновесное отношение $\frac{Ti^{2+}}{Ti^{2+}+Ti^{3+}}\cdot 100\%$	⑤ Автор
KCl — NaCl	720	1 –4,7	80 –90	⑥ Наши данные
KCl — NaCl	700	1,8—8,5	87 —91	⑦ Крей и Келлог [2]
NaCl — $SrCl_2$	700 - 850	1,6—4,9	78—93	⑧ Мелгрен и Опий [1]
NaCl—$CaCl_2$—$BaCl_2$	720	0,1—0,9	60—67	⑥ Наши данные
$MgCl_2$	760	0,1—0,5	46—50	» »
CsCl	720	0,4—2,4	63—73	» »

Table 5. Shift of equilibrium between $TiCl_2$, $TiCl_3$, and Ti under the action of the medium of the melt.
Legend: 1) melt; 2) temperature; 3) total Ti content of the melt; 4) equivalent ratio; 5) references; 6) data of the authors; 7) W. Kreye, H. Kellog, Ref. 2 (see below); 8) S. Mellgren, W. Opie, Ref. 1 (see below).

S/073/61/027/002/002/004
B101/B208

AUTHORS: Markov, B. F., Voytovich, B. A., Barabanova, A. S.

TITLE: Molecular state of compounds accompanying titanium tetrachloride

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 27, no. 2, 1961, 151-154

TEXT: During the preparation of $TiCl_4$ by chlorination of titanium-containing slag also chlorides of Mg, Fe, Si, V, Al etc. are formed. To purify $TiCl_4$ completely from these impurities, the molecular state of the latter and their behavior with respect to $TiCl_4$ has to be studied. A kryoscopic study has now been made of the isomolar series of VCl_4, $VOCl_3$, and $TiCl_4$ on the one hand, and of $AlCl_3$, $FeCl_3$, and $ZrCl_4$ on the other. The chlorides of Al, Fe, Zr being only little soluble in $TiCl_4$, nitrobenzene was used as solvent. It is pointed out that the results may be influenced by interaction of $C_6H_5NO_2$ with the chlorides. The initial substances were prepared as follows: 1) $FeCl_3$ by chlorination of Armco iron at 350°C, sublimation of $FeCl_3$ in an argon atmosphere; 2) VCl_4 by chlorination of V metal and distillation, first

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in the chlorine stream, then in vacuo; 3) $VOCl_3$ by chlorination of V_2O_5 in the presence of carbon, and fractional distillation of the product; 4) $ZrCl_4$ by chlorination of ZrO_2 and sublimation in the hydrogen stream at 340-350°C; 5) chemically pure $AlCl_3$ was sublimed in the presence of Al metal; 6) pure $TiCl_4$ was distilled on copper filings; 7) nitrobenzene was distilled on P_2O_5. The deviation of the freezing-point depression from the additive value was determined for the following systems: $VOCl_3$ - $AlCl_3$; $VOCl_3$ - $FeCl_3$; $VOCl_3$ - $ZrCl_4$; VCl_4 - $AlCl_3$; VCl_4 - $FeCl_3$; VCl_4 - $ZrCl_4$; $TiCl_4$ - $AlCl_3$; $TiCl_4$ - $FeCl_3$; and $TiCl_4$ - $ZrCl_4$. The molecular state of the chlorides in nitrobenzene had previously been studied by determining the molecular weight. It is known from publications that the molecular weights of $TiCl_4$ and $ZrCl_4$ in nitrobenzene agree with the theoretical values. The same was found for $VOCl_3$. In the case of VCl_4, partial dissociation occurs when changing the concentration from 0.348-0.0347 mole/kg, the molecular weight varies continuously from 188.2 to 177.2 (theoretical value 192.78).

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Table 1 presents data for $AlCl_3$ and $FeCl_3$. In order to determine the electrolytic dissociation of the chlorides in nitrobenzene, the electrical conductivity of their solutions was measured at 25°C (Table 2). $TiCl_4$ in nitrobenzene has a conductivity of the order of 10^{-5} $ohm^{-1} \cdot cm^{-1}$, according to publications. In all systems studied here, the kryoscopic investigation of the isomolar series (concentration: 0.05-0.07 mole/kg) showed no deviations of the freezing-point from the additive value, which were beyond the error in measurement. It may be concluded therefrom that in nitrobenzene, the chlorides of vanadium form no compounds with those of Al, Fe, and Zr. There are 3 tables and 16 references: 9 Soviet-bloc and 7 non-Soviet-bloc. The 2 most recent references to English-language publications read as follows: H. Nishida, K. Oyama, J. Chem. Soc. Japan, Ind. Chem. Soc., 60, 1434, (1957); V. V. Dadape, M. R. A. Rao, J. Amer. Chem. Soc., 77, 6192 (1955).

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN USSR (Institute of General and Inorganic Chemistry, AS UkrSSR)

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Table 1. Molecular weights of $AlCl_3$ and $FeCl_3$ in nitrobenzene.

Legend: 1) concentration, mole/kg;
2) Δt, determined experimentally;
3) degree of association $i = M_{exp}/M_{theor}$.

(1) Концентрация, моль/кг	(2) Δt экспериментальное	Степень ассоциации $i = \frac{M \text{ экспериментальный}}{M \text{ теоретический}}$ (3)
$AlCl_3$		
0,237	1,580	1,037
0,172	1,125	1,057
0,148	0,930	1,099
0,0921	0,560	1,134
0,0803	0,475	1,167
0,0657	0,372	1,219
0,0531	0,305	1,200
0,0521	0,296	1,215
0,0237	0,130	1,259
$FeCl_3$		
0,261	1,755	1,027
0,156	1,014	1,062
0,097	0,607	1,102
0,0831	0,512	1,120
0,0733	0,442	1,145
0,0601	0,357	1,162
0,0404	0,206	1,351
0,0388	0,195	1,375
0,0233	0,090	1,785
0,0209	0,075	1,923

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Table 2. Specific electrical conductivity of solutions of V, Al, Fe, and Zr chlorides in nitrobenzene at 25°C.
Legend: 1) concentration, wt%;
2) K·10⁵, ohm⁻¹·cm⁻¹.

(1) Концентрация, вес. %	(2) ×·10⁵, ом⁻¹·см⁻¹
$VOCl_3$	
0,52	6,63
1,09	4,65
4,92	3,44
11,04	1,38
12,10	1,18
VCl_4	
0,94	0,142
1,96	0,211
4,80	0,321
9,33	0,492
$AlCl_3$	
0,69	19,8
0,86	22,7
3,07	57,1
$FeCl_3$	
0,28	9,71
1,04	20,9
2,14	30,3
5,21	64,2

S/073/61/027/005/001/004
B103/B101

AUTHORS: Markov, B. F., Voytovich, B. A., Barabanova, A. S.

TITLE: Interaction of compounds accompanying titanium tetrachloride
II. Vanadium compounds

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 27, no. 5, 1961, 580-584

TEXT: The authors continued their studies on the physicochemical conditions of purifying $TiCl_4$ (Ukr. khim. zh., 27, 151 (1961)). Chlorination of titanium-containing slags yields, in addition to $TiCl_4$, vanadium chlorides (mainly oxychloride) which are completely soluble in $TiCl_4$. In order to explain the interaction of $VOCl_3$ with chlorides of various metals, as well as with $POCl_3$ and CrO_2Cl_2, the following binary systems were subjected to thermal analysis: $VOCl_3$ - $AlCl_3$; $VOCl_3$ - $SiCl_4$ ($POCl_3$, CrO_2Cl_2); $VOCl_3$ - $NbCl_5$ ($TaCl_5$). Sealed Stepanov ampuls were used for this purpose [Abstracter's note: Ampul not defined], since the substances used

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readily hydrolyze. Melting points were measured on a Chromel-Alumel thermocouple by taking heating curves on a selfrecording Kurnakov pyrometer. It was found that $VOCl_3$ forms the compound with $POCl_3$: $VOCl_3 \cdot 2POCl_3$; and VCl_4 forms the compound: $VCl_4 \cdot 2POCl_3$. VCl_4 forms a continuous series of solid solutions with $SiCl_4$. The phase diagrams of the systems of $VOCl_3$ with $AlCl_3$, $NbCl_5$, and $TaCl_5$ are eutectic. This also holds for the systems VCl_4 - $POCl_3$ ($SiCl_4$). The systems $VOCl_3$ - $SiCl_4$ and $VOCl_3$ - CrO_2Cl_2 proved to be transition systems between continuous solid solutions and the eutectic. Calculation by Schroeder's equation confirmed that aluminum chloride in the $VOCl_3$ - $AlCl_3$ melt has the form of Al_2Cl_6. There are 5 figures, 3 tables, and 7 references: 4 Soviet and 3 non-Soviet. The three references to English-language publications read as follows: J. C. Scheldon, S. Y. Teree, J. Amer. Chem. Soc., 81, 2290 (1959); R. L. Harris, R. E. Wood, H. L. Ritter, J. Amer. Chem. Soc., 73, 3151 (1951); H. Nishida, K. Oyama, J. Chem. Soc., Japan Ind. Chem.

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S/073/61/027/005/001/004
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Soc., 60, 1434 (1957).

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN USSR
(Institute of General and Inorganic Chemistry AS UkrSSR)

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30869
S/073/61/027/006/001/00[illegible]
B110/B147

52200

AUTHORS: Markov, B. F., Gitman, Ye. B. and Tishura, T. A.

TITLE: Equilibrium between $TiCl_3$ $TiCl_2$ and Ti metal in molten chlorides of alkali metals

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 27 no. 6, 1961 [illegible]

TEXT: The technologically important equilibrium between low Ti chlorides and Ti metal in individually molten alkali chlorides was investigated. In the absence of neutral salts, $TiCl_2$ is formed: $2\,TiCl_3 + Ti \rightarrow 3\,TiCl_2$ (1) ($\Delta Z \sim 22$ kcal/700°C). If $TiCl_2$ and $TiCl_3$ are found in simplest physical solution in molten salts $TiCl_3$ forms complexes with CsCl, RbCl, KCl, NaCl. Me_3TiCl_6, and $MeTiCl_4$, whose resistance to heat decreases from Cs to Na. $TiCl_2$ forms compounds of Me_2TiCl_4 and $MeTiCl_3$. No complexes are formed in LiCl melt. In CsCl they form complex anions.

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Equilibrium between $TiCl_3$, $TiCl_2$ and .

The equilibrium is determined by the ratio of the activities of $TiCl_2$ and $TiCl_3$, $TiCl_3$ being the better complex former. When changing from CsCl LiCl the equilibrium is shifted from left to right. In the LiCl melt (615°C), almost complete $TiCl_2$ formation takes place ($Ti^{2+}/(Ti^{2+} + Ti^{3+})$ = 95-100%; in NaCl melt (860°C, only 80-85% of $TiCl_2$ is formed, with $TiCl_3$ forming complexes. In melts with KCl (800°C) 59-82% of $TiCl_2$ is found and $TiCl_3$ and $TiCl_2$ are forming complexes with KCl. When the temperature is reduced from 860 to 380°C, only 60-65% of $TiCl_2$ is observed in the molten KCl-LiCl eutectic (380°C). 85-94% of $TiCl_2$ is found in molten CsCl (720°C), since with increasing stability of the $TiCl_3$ complex the $TiCl_2$ complex also becomes more stable. It was found that the equilibrium was shifted in a melt in which low Ti chlorides are dissolved. This is caused by the variation of activity of titanium chlorides as

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Equilibrium between $TiCl_2$, $TiCl_3$, and ...

result of complex formation. A study of S. F. Belov and S. I. Sklyarenko is mentioned. There are 4 tables and 15 references: 8 Soviet and 7 non-Soviet. The three most recent references to English-language publications read as follows: S. Mellgren, W. Opie, J. Metals, 9, 266 (1957); W. Kreye, H. Kellogg, J. Electroch. Soc 104, 504 (1957) R. B. Head, Austr. Journ. of Chem., 13, 332 (1960).

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