1. SERGEYEV, V.: ZHURKOVSKAYA, G.: PAL'GOVA, M.

2. USSR (600)

4. Butter

7. Storage stability of molded sweet cream butter. Mol. prom. 13 no. 11, 1952.

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

BASIN, Valentin Yakovlevich; BALAKAYEV, T.B., kand. ist. nauk, otv. red.; PAL'GOVA, Z.N., red.

[Heavy industry of Kazakhstan in the Great Patriotic War; an historical study] Tiazhelaia promyshlennost' Kazakhstana v Velikoi Otechestvennoi voine; istoricheskii ocherk. Alma-Ata, Nauka, 1965. 162 p. (MIRA 18:7)

PAL'GOV, N.N., otv. red.; VILESOV, Ye.N., red.; ZENKOVA, V.A.,
red.; MAKAREVICH, K.G., red.; CHERKASOV, P.A., red.;
PAL'GOVA, Z.N., red.

[Glaciological research in Kazakhstan] Gliatsiologicheskie issledovaniia v Kazakhstane. Alma-Ata, Nauka.
No.5. 1965. 189 p. (MIRA 19:1)

1. Akademiya nauk Kazakhskoy SSR, Alma-Ata, Sektor fizicheskoy geografii.

GALUZO, Petr Grigor'yevich; DUBROVSKIY, S.M., doktor istor.nauk,
prof., red.; PAL'GOVA, Z.N., red.

[Agrarian relations in southern Kazakhstan in 1867-1914]
Agrarnye otnosheniia na IUge Kazakhstana v 1867-1914 gg.
Alma-Ata, Nauka, 1965. 344 p. (MIRA 18:4)

PAL'GUNOV, N.

New stage of news photography. Sov.foto 19 no.3:1-3 Mr '59.
(MIRA 12:4)

1. General'nyy direktor Tlegrafnogo agentstva SSSR.
(Photography, Journalistic)

PAL'GUNOV, V.

Public representation council attached to the department of labor and wages. Sots.trud 7 no.1:103-106 Ja '62. (MIRA 15:4)
(Leningrad Economic region—Radio industry)

[illegible]

[illegible] the [illegible] ation of the [illegible] antitetanic serum. [illegible]

1. [illegible] University [illegible] Kosice.

FIL'GUEV, S.

Karpachev, S. and Fil'guev, S., Determination of the transfer numbers of cation and anion in pure melted salt. P. 942

The transfer numbers of the cation and anion in melted lead chloride are measured with and without a porous diaphragm. Values for the transfer numbers of the cations and anion were obtained in an interval of 0.1-0.2 and 0.9-0.8 respectively; that is, the mobility of the cation in melted lead chloride is much smaller than that of the anion.

Lab. of Electrochemistry
The Ural Branch of Acad. of Sci., USSR
Sept. 7, 1948

SO: Journal of Physical Chemistry, (USSR) 3, No. 8 (1949)

PAL'GUYEV, S.

25538. Opvyed Yelenie Ahis Yel Pyevyenosa Kationa I-aniona V Chistoy Rasplavlyennoy Soli. Zhurnal Fiz. Khimii, 1949 VYP. 8 c 942-52

SO: Letopis' Zhurnal'nykh Statey, Vol. 34, Moskva, 1949

4

r 4

Determination of the transference numbers of cations and anions in a pure molten salt. S. Karpachev and S. Pal'guev. *Zhur. Fiz. Khim.* **23**, 942-52(1949).—Three methods were used: (1) Two glass test tubes were connected near the bottom by a glass tube contg. asbestos and then filled with known amts. of molten salt. After passage of elec. current the wts. of the salt in the test tubes were detd. again. (2) A radioactive isotope was added to the salt in one of the above test tubes. (3) The radioactive isotope was used but there were anodic, cathodic, and middle compartments all joined by wide tubes without asbestos. $PbCl_2$ was the salt, Ra D the indicator, and the electrodes were usually of C. The transference no. of Pb between 520 and 680° was 0.1-0.2 and that of Cl 0.8-0.9. The agreement between (1) and (2) shows the correctness of arrangement (1), and the agreement between (2) and (3) shows that electroösmosis through asbestos membrane was negligible. J. J. Bikerman

ACCESSION NR: AT4008735 S/2631/63/000/004/0083/0090

AUTHOR: Neuymin, A. D.; Pal'guyev, S. F.;Strekalovskiy, V. N.; Burov, G. V.

TITLE: Investigation of the structural components and electrical conductivity and its nature in the systems ZrO_2-CaO-NiO and ZrO_2-CaO-Fe_2O_3

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii, Trudy*, no. 4, 1963. Elektrokhimiya rasplavlenny*kh solevy*kh i tverdy*kh elektrolitov, 83-90

TOPIC TAGS: refractory oxide, electric ceramic, zirconium dioxide, calcium oxide, nickel oxides, NiO, iron oxides, Fe sub 2O sub 3, ternary oxide mixture, ZrO sub 2-CaO-NiO system, ZrO sub 2-CaO-Fe sub 2O sub 3 system, metal oxide system, electrolytic cell, solid electrolyte

ABSTRACT: Maintaining the relation Zr_2O:CaO = 85:15, the structure and electrical conductivity have been studied in a series of oxide mixtures of the above systems. X-ray examinations combined with phase chemical analysis were applied in the study of the structure and a "Ural 1" computer was used to calculate the interplane distances and lattice parameters. The conductivity was measured with an alternating current bridge at a frequency of 3000 cps. Its nature was studied by the emf method. The procedures are given in detail in Trudy* Instituta Elektrokhimii UFAN SSSR, no. 1, 1960, 111; no 2, 1961;

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ACCESSION NR: AT4008735

no. 3, 1962, 133 and in DAN SSSR, 1960, 134, 1138. It was found that NiO is only slightly soluble in mixtures of ZrO_2-CaO and solid solutions form when Fe_2O_3 is added. Iron ions place themselves partly in the intersections, and partly in the interspaces of the cubic lattice of a solid solution. The conductivity of the mixture decreases monotonously and remains practically of a purely ionic nature as the Ni content increases up to 30 mol % in a wide temperature range. Fe_2O_3-additions up to 6 mol % cause no noticeable decrease in conductivity and do not affect its nature. Greater Fe_2O_3-additions enhance the electron component of conductivity. Orig. art. has: 5 figures, 2 tables and 4 formulas.

ASSOCIATION: Institut elektrokhimii, Ural'skiy filial AN SSSR (Electrochemical Institute, Urals Branch, AN SSSR)

SUBMITTED: 00 DATE ACQ: 25Jan64 ENCL: 00

SUB CODE: GC,SS NO REF SOV: 011 OTHER: 013

Card 2/2

[illegible]NA, [illegible]

[illegible] and CeO_2 - SrO. [illegible]
Inst. elektrokhim. [illegible]

[illegible]MAN, [illegible]

[illegible] of [illegible] of a mixture of oxides of the CeO$_2$ - La$_2$O$_3$ system and the conductance of mixtures. Trudy Inst. elektrokhim. UFAN SSSR no.[illegible]:97-110 '63. (MIRA [illegible])

NEUYMIN, A.D., YUSHINA, L.D., OVCHINNIKOV, Yu.M.; PAL'GUYEV, S.F.

Nature of the conductance of solid solutions Bi_2O_3 - SrO.
Trudy Inst. elektrokhim. UFAN SSSR no.4:111-115 '63.
(MIRA 17:5)

PAL'GUYEV, S.F.

Dependence of the quality of cathodic nickel deposits on the presence of impurities in the electrolyte. S. F. Pal'guev, M. V. Smirnov, and S. V. Karpachev. J. Appl. Chem. U.S.S.R. 26, 45-8(1953)(Engl. translation).—See C.A. 47, 6794f. H. L. H.

PAL'GUYEV, S.F.; SMIRNOV, M.V.; KARPACHEV, S.V.

Dependence of the quality of cathodic nickel deposits on the presence of impurities in the electrolyte. Zhur.Priklad.Khim. 26, 50-4 '53. (MLRA 6:2)
(CA 47 no.14:6794 '53)

1. Chem.-Met.Inst., Ural Branch Acad. Sci. U.S.S.R., Sverdlovsk.

PAL' GUYEV, S.F.

USSR

Cathodic deposition of nickel from molten chloride baths. S. F. Pal'guev and M. V. Smirnov. *J. Appl. Chem. U.S.S.R.* 26, 1107-14(1953)(Engl. translation).—See *C.A.* 48, 8055e. H. L. H. M

PAL'GUYEV, S. F. - SMIRNOV, M. V. - KARPACHEV, S. V.

Nickel

Dependence of the quality of cathodic nickel precipitates on the pressure of admixtures in the electrolyte. Zhur. prikl. khim. 26 no. 1, 1953

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

②

Cathodic deposition of nickel from molten chloride baths. II. S. F. Pal'guev and M. V. Smirnov. *Zhur. Priklad. Khim.* 26, 1166-75(1953); cf. *C.A.* 47, 6794*i*.—Properties of cathode deposits of Ni obtained in Cl baths strongly depend on c.d.; 0.005 amp./sq. cm. gives a fairly dense cryst. deposit. Increase in c.d. increases the amt. of dendrites formed. Optimum c.d. is at 0.015 amp./sq. cm. with a thickness of 0.11 mm. Preliminary bubbling of HCl shows influence on the character of cathode deposits of Ni only in the case of Cl and phosphate baths, but not in F baths. This indicates that the character of the cathode deposit is influenced, apart from the formation of oxide films on the surface of the metal, by the nature of the anion. The specific influence of F^- on the properties of cathode deposits of Ni on electrolysis from molten baths can be explained by the poor wetting of metals by molten fluorides. V. N. B.

SMIRNOV,M.V.; PAL'GUYEV,S.F.; IVANOVSKIY,L.Ye.

A chlorine-coated graphite electrode for comparing fused chloride data. Zhur.fiz.khim.29 no.5:772-777 My'55. (MIRA 8:12)

1. Ural'skiy filial Akademii nauk SSSR., Laboratoriya elektrokhimii, Sverdlovsk
(Electrodes) (Chlorides)

137-1958-2-2646

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 63 (USSR)

AUTHORS: Smirnov, M.V., Pal'guyev, S.F., Volchenkova, Z.S.

TITLE: The State of the Oxygen in Salt Melts Containing Titanium (O sostoyanii kisloroda v solevykh rasplavakh soderzhashchikh titan)

PERIODICAL: Izv. Vost. fil. AN SSSR, 1957, Nr 3, pp 94-101

ABSTRACT: On the basis of experimental data on the electrolysis of fluoride-chloride melts containing Ti^{4+} it was shown that the effect of the atmospheric O_2 within them and the suspended insoluble dioxide led to the formation of oxy-cations of the TiO^{2+} and $Ti_2O_3{}^{2+}$ type, which when discharged at the cathode yield well formed crystalline precipitates of the lowest Ti oxides. These oxides were precipitated with potentials 1.3 - 1.4 volts more positive than the potential used to segregate metallic Ti, and 2.2 - 2.3 volts more positive than the potential used to segregate an alkali metal. Tests were made to clarify the nature of the processes which take place at the cathode and at a carbon anode when electrolysis occurs with small current densities. It was found that the reduction of Ti^{4+} to the lowest valences at the cathode was

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137-1958-2-2646

The State of the Oxygen in Salt Melts Containing Titanium

accompanied by the discharge of oxy-cations with the formation of precipitates of the lowest Ti oxides At the anode, simultaneously with the oxidation of the lowest-valence Ti, an electrochemical reaction took place with the oxy-cations adsorbed on the carbon. $TiO^{2+} + 1/2 C - 2e = Ti^{4+}$ (melt) + $1/2 CO_2$. Chlorination reactions involving the particles of TiO_2, Ti_2O_3, and TiO suspended in the melt were also possible. The anode potential during these processes was ∼0.4 volts more negative than the potential of a chlorine electrode.

N. P.

1. Fluoride melts--Electrolysis 2. Chloride melts--Electrolysis
2. Oxygen--Determination

Card 2/2

Pal'guev, S. F.

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Thermodynamics of the reaction of calcium chloride with
fused chlorides of alkali metals. M. V. Smirnov, S. F.
Pal'guev, L. A. Lyapina, and Yu. N. Krasnov. Zhur.
Fiz. Khim. 30, 1651-8(1957).—The nearest to a Ca re-
versible electrode is CaO + C. This too decrepitates in
pure fused $CaCl_2$, but a few measurements of the e.m.f. of
the cell CaO + C | fused $CaCl_2$ | Cl, C were made at 800°;
E = 1.6 v. The isobaric potential ΔZ, based on the reaction
$CaO_s + 0.5C_s + Cl_{2g} = CaCl_{2l} + 0.5CO_{2g}$ is −73.8 kcal./
mol. This agrees with the value −74.1 calcd. from $\Delta Z_1 =$
$(-78.7 + 4.3 \times 10^{-3}T) \pm 1.8$ kcal./mol. $CaCl_2$. The
e.m.f. of the cell CaO + C | melt: 0.60 wt. % $CaCl_2$ +
99.40% (NaCl + KCl) | Cl, C detd. with electrodes of a
wide range of mol. fractions of CaO and C in the 800-900°
2.5° range was expressed by $\epsilon = (1.8245 + 1.00 \times 10^{-4}T)$
± 0.0046 v. Then the free energy of 0.60% $CaCl_2$ in
equimol. NaCl and KCl is $\Delta Z_1 = (-84.153 - 0.179T) \pm$
2.08 kcal./mol. $CaCl_2$ and that of diln. from pure $CaCl_2$ to
0.60% $CaCl_2$ is $\Delta Z_4 = \Delta Z_3 - \Delta Z_1 = (-5.5 - 13.5 \times 10^{-3}T)$
± 2 kcal./mol. $CaCl_2$; $\Delta H_4 = -5.5$ kcal./mol. $CaCl_2$
and $\Delta S_4 = 13.5$ kcal./degree mol. $CaCl_2$. These data and
available data on similar systems suggest the existence of
$CaCl_4^{--}$ in dil. melts which decomp.: $CaCl_4^{--} \rightarrow CaCl_3^{-} \rightarrow$
$CaCl_2 \rightarrow CaCl^{+}$ and $CaCl^{+} + 3Cl^{-} \rightarrow CaCl_4^{--}$; $H_4 =$
−5.5 kcal./mol. $CaCl_2$.

I. Bencowitz

1/1

5.2200(A) 5.4700
5.4600(A)

66574
SOV/81-59-13-45035

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 13, p 44 (USSR)

AUTHORS: Smirnov, M.V., Ivanovskiy, L.Ye., Pal'guyev, S.F., Volchenko, Z.S., Yushina, L.D.

TITLE: The emf-Method for Studying the Thermodynamics of Some Reactions at High Temperatures

PERIODICAL: Tr. in-ta khimii. Ural'skiy filial AS USSR, 1958, Nr 2, pp 143 - 151

ABSTRACT: In the electrolysis of fused chloride baths CO_2 is separated on the anodes prepared from an intimate mixture of oxides and carbon and the ions of the corresponding metals pass into the electrolyte. The oxide-carbon electrodes of thorium, calcium, beryllium, etc. in equilibrium are reversible in relation to their ions being in the electrolyte. This permits to utilize them by the emf-method for elucidating the thermodynamics of reactions, in which oxides and carbon take part at high temperatures. The equilibrium potentials of the electrodes are determined by the activity of the ions of the corresponding metals in the electrolyte and by the CO_2 pressure over them according to the electrode reaction $M_2O_n + n/2C - 2ne \rightleftarrows 2M^n$ + (fusion) + $n/2CO_2$, E =

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SOV/81-59-13-45035

The emf-Method for Studying the Thermodynamics of Some Reactions at High Temperatures

const + $(RT/n)\ F\ln a_{M}n + (RT/4F)\ln P_{CO_2}$. They do not depend on the molar ratio of CO and carbon. By measuring emf the changes can be found in the isobaric potential ΔZ, in the entalpy ΔH and entropy ΔS of the corresponding reactions of chlorination $M_2O_n + n/2C + nCl_2 = 2MCl_n$ (smelt) $+ n/2CO_2$. Oxide-carbon electrodes in combination with metal electrodes made it possible to study the thermodynamics of the interaction of the fused chlorides of thorium, beryllium and calcium with the chlorides of the alkali metals. For determining the decomposition tension of the fused chlorides of higher valencies a method has been developed permitting to measure the value of the decomposition tension of $PlCl_2$ and $ThCl_4$ The change in the thermodynamic parameters has been calculated for the reaction Th (solid) + $2Cl_2$ (gas) = $ThCl_4$ (liquid), $\Delta Z = 2.772 - 5.61\cdot 10^{-4}$ T. Based on the emf of the cell $Th \mid ThCl_2 \parallel KCl, ThCl_4 \mid Cl_2, C$, it has been found for the decomposition tension of $ThCl_2$; $E = 3.27 - 10.8\cdot 10^{-4}$ T, $\Delta Z = 150{,}900 + 49.7T$ cal/mole. For the reaction $ThCl_4$ (liquid) + Th (solid) = $2ThCl_2$ (liquid), $\Delta Z = -23{,}000 + 23.8T$ cal/mole $ThCl_2$. The thermodynamics of the formation of alloys of thorium with zinc has been studied. For the reaction of reducing ThO_2 by carbon to metal $\Delta Z = 20{,}000 - 77.5T$ cal/mole.

A. Zolotarevskiy

Card 2/2

67625

5.1310(B)

SOV/81-59-14-[illegible]

Translation from: Referativnyy zhurnal, Khimiya, 1959, Nr 14, p 318 (USSR)

AUTHORS: Pal'guyev, S.F., Volchenkova, Z.S.

TITLE: The Problem of a Solid Electrolyte for Fuel Elements

PERIODICAL: Tr. in-ta khimii, Ural'skiy fil. AS USSR, 1958, Nr 2, pp 183 - [illegible]

ABSTRACT: A method of preparation has been described and results are cited of measurements of the electric conductivity of solid electrolytes for fuel elements: a) O.K. Davtyan's electrolyte and its individual components (Na_2CO_3, calcined monazite); b) a series of mixtures of oxides on the base of zirconium dioxide: 60 molar % ZrO_2 + 40 molar % CeO_2; [illegible] molar % ZrO_2 + 33.3 molar % La_2O_3; $3ZrO_2 \cdot 2CeO_2$ + 10 weight % [illegible]. The measurements of electric conductivity were carried out by the impedance bridge method at a frequency of 1,000 cycles. The circuit permitted the determination of the resistance with an accuracy of 1 - 10%, depending on the value of the measured resistance. The conductivity was measured in a range of temperature from room temperature to 1,000°C. The activation energies were calculated from the curve of the electric conductivity ver

Card 1/2

67625

The Problem of a Solid Electrolyte for Fuel Elements SOV/81-59-14-50212

1/T (T is the absolute temperature) for sections with different slopes. On the basis of the obtained data assumptions are made concerning the character of the electric conductivity of oxide systems. There are 30 references.

F. Lukovtsev

Card 2/2

SOV/58-59-8-18207

Translated from: Referativnyy Zhurnal Fizika, 1959, Nr 8, p 168 (USSR)

AUTHORS: Volchenkova, Z.S., Pal'guyev, S.F.

TITLE: The Temperature Dependence of the Electrical Conductivity of Nickel and Chromium Oxides

PERIODICAL: Tr. In-ta khimii. Ural'skiy fil.-AN SSSR, 1958, Nr 2, pp 201-207

ABSTRACT: The temperature denpendence of the electrical conductivity (σ) of polycrystalline samples of NiO and Cr_2O_3, sintered at 1,550°C, was studied in the interval of 150 to 900°C. σ was measured by means of the contact method with the aid of an alternating current bridge at a frequency of 1 kc. Contact resistances did not affect the temperature independence of σ. It was established that σ for NiO, unlike Cr_2O_3, increases sharply with an increase in the quantity of adsorbed oxygen, while the activation energy of the conductivity of NiO, measured on rectilinear sections, decreases. In the case of Cr_2O_3 the activation energy of σ falls with an increase in temperature. The absence of ionic conductivity under the conditions of the experiment was established by means of a chemical analysis of the areas near the electrodes.

E. Yenikeyev

Card 1/1

Pal'guyev, S.F.

Distr: 4E4j

Equilibrium potentials of calcium oxide-carbon electrodes. M. V. Smirnov, S. F. Pal'guev, Yu. N. Krasnov, and L. A. Lyapina. *Zhur. Priklad. Khim.* 31, 66-71(1958); cf. *C.A.* 51, 1750g.—The equil. potential *E* of CaO-C electrodes in fused mixts. equimol. KCl + NaCl contg. different mol. fractions *N* of $CaCl_2$ was detd. at 800 ± 2.5° against a standard Cl electrode (*loc. cit.*). From 2 to 5 CaO-C electrodes contg. different proportions of CaO were placed in the electrolyte around the Cl electrode. An atm. of CO_2 was maintained over the electrolyte. The proportion of CaO did not affect *E*. On the other hand, *E* decreased linearly (slope of line 0.106) as *N* increased to 0.05 (16.5 wt. % $CaCl_2$) and decreased rapidly as *N* increased, i.e. the activity coeff. $f_{Ca}/f_{Cl} > 1$. The effect of CO_2 up to $P = 0.25$ atm. on *E* was expressed by $E = C + 0.058 \log P_{CO_2}$, where $C = 2.3\ RT/4F$; *E* was controlled by the reaction $2CaO + C - 4e \rightleftharpoons 2Ca^{++}_{soln} + CO_2$. There was a break in the *E* vs. *P* curve at $P > 0.25$ atm. The presence of $CaCO_3$ in the electrolyte did not affect *E*. I. Bencowitz

PAL'GUYEV, S F

SMIRNOV, M.V.; PAL'GUYEV, S.F.; KRASNOV, Yu.N.

The behavior of carbon dioxide calcium electrodes during electrolysis of fused chlorides. Zhur. prikl. khim. 31 no.2:226-233 F '58.
(Electrodes, Carbon) (Electrolysis) (Chlorides) (MIRA 11:5)

05878
SOV/78-4-11-31/50

5(2)

AUTHORS: Pal'guyev, S. F., Alyamovskiy, S. I., Volchenkova, Z. S.

TITLE: Investigation of the Phase Components of the System CeO$_2$ ZrO$_2$

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 11, pp 2571 - 2576 (USSR)

ABSTRACT: This is a report on the structure and the ceramic properties of the system CeO$_2$-ZrO$_2$. The samples were prepared from mixtures of pure oxides. The spectroscopically determined content of impurities in the initial substances is given in table 1. The powders were pressed, a binding agent (natural rubber in benzene) being used for samples with more than 80% ZrO$_2$. The samples were then sintered and X-ray investigated with copper K$_\alpha$-radiation (powder camera of type RKD and inverting camera of type KROS). Besides, the density, color and linear shrinking (Fig 2) in sintering were determined. Table 2 gives the chemical composition, the phase composition, the lattice constants, and the color of the samples. A solid solution with cubic lattice develops between 0 and 50 mol% ZrO$_2$, a monoclinic phase exists between 0 and 10 mol% CeO$_2$, a tetragonal phase at 70 mol% ZrO$_2$. Figure 1 shows that the lattice period changes

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SOV [illegible]

Investigation of the Phase Components of the System CeO_2-ZrO_2

linearly with the composition and exhibits statistically distributed lattice defects which are probably situated in the lattice points occupied by the Ce^{4+}- and O^{2-} ions. The samples with 70 mol% ZrO_2 have the greatest hardness; linear shrinking exhibits a minimum at 20-25 mol% ZrO_2; the samples with 10-20 mol% ZrO_2 are most intensely colored. A vigorous interaction between the two components seems to take place in this range (between 10 and 30 mol% ZrO_2). This interaction cannot be determined by X-ray investigation. It should, however, become manifest in the electric properties. There are 2 figures, 4 tables, and 3 references.

ASSOCIATION: Ural'skiy filial AN SSSR, Institut elektrokhimii (Ural Branch of the AS USSR, Electrochemical Institute)

SUBMITTED: June 5, 1958

Card 2/2

SOV/7[illegible] 33-8-[illegible]

5(4)

AUTHOR: Pal'guyev, S. F.

TITLE: On the Nature of the Conductivity of Solid Sodium Carbonate

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 8, pp 1805-1810 (USSR)

ABSTRACT: Although sodium carbonate (I) is used, alone or in mixtures as a flux, its electroconductivity (EC) has so far not been examined. In the present case the transfer number of sodium ions (TNS) in solid (I) was measured at 400-650°C according to the method described in reference 7. Also, the yield of gaseous electrolysis products of (I) (with reference to the anode current) was determined at various temperatures. The measurement results (Table 1) show that the (TNS) changes from 0.90 (400°C) to 1.00 (600-650°C), i.e. that solid (I) is a cation conductor at temperatures of 600° and up. The investigation results (Table 2) regarding the above mentioned gas yield show that the yield in anodic electrolysis products of (I) correspond to Faraday's law at 550-600°C and [illegible] only since the yield falls (90%) as the temperature is lowered (400°C). This suggests that at temperatures < [illegible]°C the fraction of electron conductivity rises (probably due to

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SOV/7[illegible]-3[illegible]

On the Nature of the Conductivity of Solid Sodium Carbonate

impurities). The curve of the temperature function [illegible] (EC) of solid (I) shows a sharp bend at about [illegible] there is a sharp rise in the activation energy of the (EC) (from 0.94 to 2.25 ev) (Ref 8), which points to a change in the character of the (EC). There are 2 tables and 1[illegible] references, 4 of which are Soviet.

ASSOCIATION: Ural'skiy filial Akademii nauk SSSR, Institut elektrokhimii, Sverdlovsk
(Urals Branch of the Academy of Sciences USSR Institute of Electrochemistry Sverdlovsk)

SUBMITTED: February 7, 1958

Card 2/2

68172

~~5(4)~~ 5.4600

SOV/20-129-6-39/69

AUTHORS: Pal'guyev, S. F., Karpachev, S. V., Yushina, L. D.

TITLE: An Electrochemical Chain With a Solid Electrolyte

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 6, pp [illegible] (USSR)

ABSTRACT: The authors investigated the temperature dependence of the electromotive force of the chain $Ag/AgBr_{solid}/Br,C$ in the region 25-421°. The electrochemical cell consisted of pressed silver bromide, to the one end of which a silver wire and to the other a carbon rod is attached. The entire cell was in a bromine atmosphere. Figure 1 gives the measured emf of the cell in dependence on temperature. The values between 110 and 421° lie on a straight line, for which an empirical equation is set up. Extrapolation to the melting point 434° of the AgBr gives an emf of 0.8033 v, which is in good agreement with the values given in reference 5 for liquid AgBr (0.8056 v), confirms the correctness of measurements, and points out that in solid AgBr electric conductivity near melting point has ionic character. The occurrence of electron conductivity in a bromine atmosphere is proven by the fact that the ion transfer number

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68172

An Electrochemical Chain With a Solid Electrolyte SOV/20-12[illegible]

for Ag^+ at 20° was between 0.03 and 0.05, and at 93° between 0.06 and 0.11, whereas that for Br^- was zero. On the basis of the thermodynamics of irreversible processes the concentration gradient of Br dissolved in solid AgBr and, thus, the gradient of the holes was calculated and the transfer number of the holes was found to be zero for the temperature interval of from 100 to 434°. The authors thank Academician A. N. Frumkin for the evaluation of their work. There are 1 figure and 8 references, 1 of which is Soviet.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR (Institute of Electrochemistry of the Ural Branch of the Academy of Sciences, USSR)

PRESENTED: July 16, 1959, by A. N. Frumkin, Academician

SUBMITTED: July 15, 1959

Card 2/2

S/631/60/000/001/004/014
B140/B110

AUTHORS: Smirnov, M. V., Palguyev, S. F.

TITLE: Behavior of anodes of an intimate mixture of titanium dioxide and carbon during electrolysis of salt melts

SOURC : Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, no. 1, 1960, 29-33

TEXT: Experiments with TiO_2 - C electrodes were conducted to examine their suitability for determining the solubility of $TiCl_4$ in chloride- and fluoride-chloride melts. Electrolysis was performed in a closed element at 10^{-4} - 1 a/cm^2. The anolyte was separated by diaphragm from the catholyte. Electrolysis of the pure equimolar NaCl - KCl melt was conducted at 700°C, that of the fluoride-chloride melt at 750°C (20% by weight of NaF). 2-3 hr after immersing the electrodes in the electrolyte, the potential of the TiO_2 - C electrode attained a constant value. At

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Behavior of anodes of an intimate ...

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B140/B110

low current density ($1\cdot10^{-4}$ - $1\cdot10^{-3}$ a/cm^2), the potential changes little, but it rises quickly at higher current densities. The redox potential of Ti^{4+}/Ti^{3+} in the chloride melt is -[illegible] v. Hence, it is concluded that Ti^{3+} passes into the electrolyte since $[Ti^{4+}]/[Ti^{3+}] \approx 10^{-2}$. The following reaction takes place. $TiO_2 + C - 4e = Ti^{4+}_{(m)} + CO_2$ (m = melt). The Ti ions enter the melt, like the low Ti oxides. Anodic dissolution depends on [illegible]$_2$ diffusion from the electrolyte to the TiO_2 - C electrode. The anode current density can only be increased when the discharged chlorine ions react with the TiO_2 - C electrode. [illegible],000 TiO_2 particles fall to 1 cm^2 of electrode surface. The effective cross section of the oxide layer was [illegible]$\cdot10^{-3}$ [illegible], the resistance [illegible] 1 ohm. The high polarization observed is due to the [illegible] concentration on the surface of oxide particles in contact with the melt, and in the concentration of Ti ions

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on the anode layer of the electrolyte. The TiO_2 - C electrode was used for dissolving $TiCl_4$ in the salt melt under conditions where only Ti^{4+} passes into the melt: anode potential -0.4 v, $D_a \approx 0.5$ a/cm^2. Only CO_2 is formed at this current density. All the Cl is consumed for chlorination of the TiO_2 - C electrode. After saturation of the melt, the ratio $[TiCl_4]/[CO_2]$ attained the value 1:1. Electrolysis was conducted at 0.2 - 0.3 a/cm^2 until the formation of $TiCl_4$ vapors. Electrolyte samples were taken and examined for their Ti content. The solubility of $TiCl_4$ at 700°C in the equimolar melt of NaCl and KCl was found to be 5.55% by weight of $TiCl_4$. The partial pressure was 570 mm Hg. The solubility of $TiCl_4$ rises in the presence of NaF with rising fluorine ion concentration in the melt. With 30% NaF content, the solubility of $TiCl_4$ was 7% by weight. Measurements by S. F. Pal'guyev and A. D. Neuymin were mentioned. There are 1 figure, 1 table, and 15 references: 14 Soviet and

S/631/60/000/001/004/014
B140/B110

Behavior of Anodes of an Intimate ...

1 non-Soviet.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR (Institute of Electrochemistry of the Ural Branch of the Academy of Sciences USSR)

SUBMITTED: [illegible]

Card 4/4

KARPACHEV, S.V.; PAL'GUYEV, S.F.

Electromotive forces of electrochemical cells with solid electrolytes. Trudy Inst.elektrokhim.UFAN SSSR no.1:79-89 '60. (MIRA 15:2)

(Electromotive force)
(Electrolytes)

KARPACHEV, S.V.; PAL'GUYEV, S.F.

Functioning of a primary cell with a solid electrolyte having both ionic and electron conductivity. Trudy Inst. elektrokhim. UFAN SSSR no.1:101-103 '60. (MIRA 15:2)
(Electric conductivity)

29413
S/081/61/000/017/0[illegible]
B102/B138

24,2130 (1142,1160,1482)

AUTHORS Karpachev, S. V., Pal'guyev, S. F.

TITLE Electromotive forces of electrochemical circuits with solid electrolytes II Coexistence of n-type and p-type conductivity in the electrolyte

PERIODICAL Referativnyy zhurnal. Khimiya, no. 17, 1961, 67, abstract 17B495 (Tr. In-ta elektrokhimii Ural'skiy fil. AN SSSR, no. 1, 1960, 91-96)

TEXT An expression is derived for the emf of a galvanic cell $A/A_{z_2}X_{z_1}/X$ C,A (A - metal of valency z_1, X - metalloid of valency z_2, C - carbon electrode, A_{z_2}, X_{z_1} - salt or oxide) taking account of ionic, n-type, and p-type conductivity. It is shown that if n-type and p-type conductivity are due to dissolution of the metal or the metalloid in the solid electrolyte the emf of the circuits under consideration may, under certain conditions, be approximately the same as its thermodynamic value [Abstracter's note Complete translation.]

Card 1/1

29414

S/081/61/000/017/014/166
B102/B138

24.2130 (1142,1160,1482)

AUTHORS Karpachev, S. V., Pal'guyev, S. F.

TITLE Electromotive forces of circuits with solid electrolytes possessing electron besides ion conductivity

PERIODICAL Referativnyy zhurnal. Khimiya, no. 17, 1961, 67-68, abstract 17Б496 (Tr. In-ta elektrokhimii. Ural'skiy fil. AN SSSR, no. 1, 1960, 97-100)

TEXT: The effect of n-type conductivity on emf is considered for the electrochemical circuit Br,C/AgBr(solid)/Ag as an example. It is shown that $E = E_o(1-t)$, where E is the total emf, E_o the emf without n-type conductivity, and t the number of electron transitions into the electrolyte. The efficiency of this kind of cell is described by the ratio $((1-\bar{t})/(1-t^{(Ag)}))100$, if the efficiency of a cell without n-type conductivity is taken as 100 %. When current is obtained from the element the Br distribution along the electrolyte changes, and the efficiency increases. [Abstracter's note: Complete translation.]

X

Card 1/1

PAL'GUYEV, S.F.; KARPACHEV, S.V.; YUSHINA, L.D.

Problem of measuring the decomposition voltage of solid
electrolyte solutions. Trudy Inst.elektrokhim.UFAN SSSR
no.1:105-110 '60. (MIRA 15:2)
(Solutions, Solid)
(Electromotive force)

31674
S/631/60/000/001/012/014
B110/B102

24.7700

AUTHORS: Pal'guyev, S. F., Neuymin, A. D.

TITLE: Study of the type of conductivity of solid oxides by the emf method

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, no. 1, 1960, 111 - 118

TEXT: The present paper deals with a new method for examining the conductivity of solid oxides and for determining the type of conductivity of solid oxides and oxide systems. Me', Me'(0)|solid electrolyte|Me'', Me''(0) and (Pt), $\underset{P_1}{O_2}$|solid electrolyte|$\underset{P_2}{O_2}$, (Pt) cells (designed as I and II) can be used to estimate the mean transference numbers of electrons and holes, τ_e and τ_o, from: $E = \left[1 - (\tau_e + \tau_o)\right]E_o$. The emf of these cells are determined from the oxygen pressure at the electrodes. $E_o = (RT/4F)\ln(P_2/P_1)$ is valid, where P_1 and P_2 are the oxygen pressures at the left and right sides of the cell. Since the solid electrolyte

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Study of the type of conductivity...

in II is in contact with oxygen, a comparison between the results [illegible] II gives the dependence of the n-type and p-type conductivities of the electrolyte on the partial oxygen pressure in the gaseous phase. Oxides calcined at 1200°C were ground with toluene or alcohol, then pressed to tablets (2 - 3 mm thick, 20 mm in diameter) at ~1500 kg/cm^2 and sintered at 1550°C. The authors used a ППТВ-1 (PPTV-1) voltmeter (accuracy ± 0.5 mv) with an M-91/A (M-91/A) galvanometer as zero indicating instrument. The resistance furnace used for heating was equipped with an ЭПВ-01 (EPV-01) thermostat. The junction of the Pt-PtRh thermocouple was on the electrolyte, its emf was measured with a ПП [illegible] (accuracy: 0.01 - 0.02 mv). For I the authors used Fe metal and FeO (2:1) (left electrode), Cu metal and CuO (1:1) (right electrode [illegible] calculated the thermodynamic emf values from FeO$_{(sol)}$ ⇌ Fe$_{(sol)}$ [illegible]

and Cu$_2$O$_{(sol)}$ + 0.5 O [illegible]

electrode [illegible]
was made in an Ar stream purified [illegible]

electrolytes, the authors used co [illegible]
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31674
S/631/60/000/001/012/014
B110/B102

Study of the type of conductivity...

ThO_2 - CaO, CeO_2 - MgO, CeO_2 - ZrO_2, CeO_2 - ZrO_2 - CaO with ionic conductivity. The n-type conductivity was low for solid solutions of ZrO_2 containing [illegible] - 40 mole% CaO and such containing 85 mole% ThO_2 + 15 mole% CaO. The emf measurements were well reproducible. The emf remained constant for several hours, and soon decreased with time and temperature when the difference between emf and its thermodynamical value was great. The change in emf can be due to (1) diffusion of oxides into the electrodes, (2) absence of a complete equilibrium at the boundary between electrode and electrolyte in the case of n-type conductivity. 85 mole% CeO_2 + 15 mole% MgO was an almost perfect n-type conductor, since CeO_2 at high temperatures and low oxygen pressure is easily reduced to Ce_2O_3. In II, the gas chambers of the electrodes were separated to allow rinsing with gases of different partial O_2 pressures. The electrolyte tablet ground in the quartz tube divided the electrode space. Fine-disperse Pt annealed at 1[illegible]0°C was used as gas electrode. A comparison of the results of measurement of I and II showed that 85 mole% ZrO_2 + 15 mole%

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B110/B102

Study of the type of conductivity...

CaO was a pure ionic conductor. The conductivity was independent of the partial [illegible] ure. [illegible] CaO was a p-type conductor. [illegible] of the n-type electrolyte [illegible] 1000°C is presumably due to quicker increase in ionic conductivity with temperature and an increase in p-type conductivity by [illegible] O_2 decomposition at high temperatures. High ionic conductivity at [illegible] partial O_2 pressure is caused by tetravalent [illegible] tables, and 6 references: 4 [illegible] and 4 [illegible] the English-language publication [illegible] J. Electrochem. Soc., 104, [illegible]

Card [illegible]

31675
S/631/60/000/001/013/014
B110/B102

24.7700

AUTHORS: Volchenkova, Z. S., Pal'guyev, S. F.

TITLE: Electrical conductivity of solid oxide systems. II. The system ZrO_2 - CaO. Electrical conductivity and transfer number

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, no. 1, 1960, 119 - 126

TEXT: The authors studied the temperature dependences of the conductivities of 100% ZrO_2 - 100% CaO samples between 300 and 1000°C, the transfer numbers, the structural properties of sintered samples, and their ceramic properties. Pure ZrO_2 and CaO or $CaCO_3$ were kept at 1200°C for 2 hrs. For samples with $<$ 40 mole% CaO the authors used CaO, for those with $>$40% CaO, they used $CaCO_3$. The mixture (200 mesh grain size) was pressed to $1.0 \cdot 1.0 \cdot 0.2 - 0.4$ cm tablets at ~4000 kg/cm², and sintered for 1 hr at 1500 ± 20°C. Linear shrinkage during sintering, properties, and color were determined. G. V. Burov made X-ray structural analysis of the

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B110/B102

Electrical conductivity of solid...

specimens with CuK_{α} radiation. At 1500°C, solid solutions and fluorite-type crystal lattices formed with 10 mole% CaO. The primary solid solution (10.0 - 40.0 mole% CaO) yields good ceramics of high density, hardness, and stability in air. Free CaO contained in samples with 80.0 - 90.0 mole% CaO reacted with atmospheric humidity. The porosity and sample volume of zirconate formed according to $ZrO_2 + CaO \rightarrow CaZrO_3$ increases while its linear shrinkage decreases. The temperature dependences of conductivities measured with a-c bridges followed the equation $\varkappa = A \exp(-\Delta E/2kT)$ where $\varkappa$ is the conductivity, A and ΔE are constants. At 750 - 800°C, the curve showed a break (except for the range where solid solutions are formed). X-ray patterns of samples with >50 mole% CaO showed CaO lines. $\varkappa$ was increased by the formation of $Ca(OH)_2$ and CaO_3 and decreased by their decomposition (700 - 800°C). The rapid increase of $\varkappa$ with the CaO content in the range of formation of solid solutions is probably due to an increase in oxygen vacancies in the lattice. With increased CaO content, the defects are no longer distributed statistically but systematically. The mobility of oxygen ions is thus reduced. With 15 mole% CaO, the conductivity maximum was observed at the minimum conductivity activation energy ΔE. The

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Electrical conductivity of solid...

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B110/B102

this case, the transfer of ions is expected to decrease with the time of electrolysis. This fact and the voltage drop in the cell after the beginning of electrolysis supported the foregoing assumption. No changes were observed with the anolyte. Since $t_k + t_a = 1$ and $t_k \approx 0$, $t_a \approx 1$. The solid solutions of ZrO_2 and CaO, which are almost perfect anion conductors at 1000°C, can be used as electrolytes for heating elements at high temperatures. There are 3 figures, 2 tables, and 12 references: 7 Soviet and 5 non-Soviet. The two references to English-language publications read as follows: K. Kuikkola, C. Wagner, J. Electrochem. Soc., 104, 379, 1957; P. Duwez, F. Odell, F. H. Brown. J. Amer. Cer. Soc., 35, 107, 1952.

Table 2. Transfer numbers in the system ZrO_2 - CaO at 1000°C. Legend: (1) composition, (2) total.

① Состав	$t_к$ ② (суммарное)	$t_а$
$0,9ZrO_2 \cdot 0,1CaO$	0,001—0,009	0,02—0,06
$0,8ZrO_2 \cdot 0,2CaO$	0,001—0,01	0,03—0,04
$0,6ZrO_2 \cdot 0,4CaO$	0,001—0,004	0,08—0,14

Table 2

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31676
S/631/60/000/001/014/014
B110/B102

24.7700

AUTHORS: Volchenkova, Z. S., Pal'guyev, S. F.

TITLE: Electrical conductivity of solid oxides. III. The system ThO_2 - CaO

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, no. 1, 1960, 127 - 130

TEXT: The present paper deals with the temperature dependence of electrical conductivity of the system ThO_2 - CaO. Pure ThO_2 and CaO were ground in an agate mortar and pressed to 1.0·1.0·0.2-0.4 cm tablets at $\sim$4000 kg/cm^2. The tablets were sintered at 1550 ± 20°C for 1 hr. The linear shrinkage, ceramic properties, and color were determined. The measuring method was described by the authors (Ref. 1: Trudy In-ta khimii UFAN SSSR, vyp. 2, 183, 1958). Pt electrodes were fixed to the polished tablet faces at $\leqslant$ 1100°C. Measurements were made at every 10° between 500 and 1100°C. The structure was studied by X-ray analysis. The conductivity increases with temperature according to $\varkappa = A \exp(-\Delta E/2kT)$. In the coordinates $\log \varkappa = f(1/T)$, the temperature is linearly dependent on the electrical

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B110/B102

Electrical conductivity of solid...

conductivity with a break at 700 - 800°C. Small additions of CaO to ThO_2 cause a sharp increase in conductivity (5% CaO increases it by more than 10 times at 1100°C and by more than 100 times at 500°C). Like in the system ZrO_2 - CaO, this increase is due to the increasing number of oxygen vacancies in the lattice of the solid solution. The slight decrease in conductivity caused by ≤ 40 mole% CaO is attributed to the vacancy interaction which hinder the migration of oxygen ions. Owing to the low sintering temperature (1550 ± 20°) solid solutions of the ThO_2 - CaO system could not be detected, not even by X-ray structural analysis. In general, the sintering temperature should be 2/3 (~ 2000°C) that of the melting temperature of ThO_2 (3300°C). Thus, the solution probably exists in the form of microscopical grains not detectable by X-ray structural analysis. The variation in activation energy with varying temperature also supports this assumption. At 500 - 750°C, a strong electrical resistance occurs between the microscopical grains of the solid solution, presumably intensified by the effect of free oxides. At 0 - 35 mole% CaO, $\Delta E_2 > \Delta E_1$. Above 750 - 800°C, ionic conductivity increases rapidly. In the range of

Card 2/3

PAL'GUYEV, S.F.; VOLCHENKOVA, Z.S. (Sverdlovsk)

Electric conductivity and transference numbers of the system $CeO_2 - ZrO_2$. Zhur. fiz. khim. 34 no.2:452-455 F '60. (MIRA 14:7)

1. Ural'skiy institut elektrokhimii.
(Cerium oxide) (Zirconium oxide)

S/020/60/133/02/41/068
B004/B064

AUTHORS: Karpachev, S. V., Pal'guyev, S. F.

TITLE: On the Operation of a Voltaic Cell With a Solid Electrolyte Having a Mixed Conductivity

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 2, pp. 396 - 398

TEXT: The authors investigated the effect upon the power of a voltaic cell of the electron conductivity of a solid electrolyte existing along with the ionic conductivity. The calculations were made from a sample cell with silver bromide as a solid electrolyte: Ag | AgBr | Br_2,C. The gaseous bromine should dissolve in AgBr and thus produce an electron conductivity of the p-type. On the condition that the bromine diffuses as far as the silver electrode and its concentration in the electrolyte is determined by the diffusion process only, the equations for the emf, the electron and hole transfer, the resistance of the electrolyte, and for the efficiency W_o without electron conductivity and for W with electron conductivity were derived (11). Equation (11) shows that in

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On the Operation of a Voltaic Cell With a Solid Electrolyte Having a Mixed Conductivity S/020/60/133/02/41/006 B004/B064

the case of an electron conductivity the power of the voltaic cell is increased to more than double the amount. However, the authors point out that the current affects the bromine concentration in the electrolyte and that the results obtained apply only quantitatively in the case of weak amperages or of a rapid diffusion of the bromine in the electrolyte. There are 3 references: 1 Soviet, 1 American, and 1 German.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR (Institute of Electrochemistry of the Ural Branch of the Academy of Sciences, USSR)

PRESENTED: March 7, 1960, by A. N. Frumkin, Academician

SUBMITTED: March 7, 1960

Card 2/2

84832

S/020/60/134/005/020/0[illegible]
B004/B064

24.7700 1143, 1138, 1395

AUTHORS: Pal'guyev, S. F., Karpachev, S. V., Neuymin, A. D., and Volchenkova, Z. S.

TITLE: Transition From Electron to Ion Conductivity as a Function of the Composition of Solid Solutions of Oxides

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 5, pp. 1138-1141

TEXT: The authors wanted to study the influence of calcium oxide upon the electrical conductivity of solid solutions of cerium and zirconium oxides. Since the solid solution $0.75CeO_2 \cdot 0.25ZrO_2$ has the highest conductivity (Ref. 1), it was used as initial substance. CaO was added in varying amounts; addition of CaO of up to 40 mole% resulted in the formation of solid solutions. The preparation of the samples was already described in Ref. 1. The relative electron and ion conductivities were determined by the solid electrolyte emf method at temperatures ranging from 500° to 1000°C, and herefrom the activation energy was computed. It was found that ion conductivity increases with an increase in tempera-

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Transition From Electron to Ion Conductivity as a Function of the Composition of Solid Solutions of Oxides

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B004/B064

ture, reaching a maximum at 700°C. Only electron conductivity is found in the system $CeO_2 - ZrO_2$; the addition of CaO diminishes the total conductivity with a minimum at approximately 6 mole% CaO; the maximum is reached at 40 mole% CaO, when the conductivity is nearly 100% ionic and approximately equal to the electron conductivity of the $CeO_2 - ZrO_2$ system. The experiments were carried out with two electrolytic chains. a) $(Pt)O_{2\,p_1}$ | solid electrolyte | $O_{2\,p_2}(Pt)$. The cell of this chain is schematically shown in Fig. 1. The sample placed in a quartz tube between platinum electrodes was at both ends in contact with oxygen of different pressures ($p_1 = 1.0$, $p_2 = 0.2$ atm). b) Me', Me'(O) | solid electrolyte | Me"(O), Me". This cell operated in vacuum without addition of gaseous oxygen. The partial pressure of O was determined from the dissociation pressure of the oxides (mixtures of Fe and FeO, Cu and Cu_2O) and ranged from 10^{-7} to 10^{-25} atm. The electron and ion conductivities were determined from $E = [1 - (\bar{t}_e + \bar{t}_o)]E_0$. E is the measured emf; $\bar{t}_e$, $\bar{t}_o$ the average

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Transition From Electron to Ion Conductivity as a Function of the Composition of Solid Solutions of Oxides

S/020/60/134/005/030/0[illegible]
B004/B0[illegible]4

transference numbers of electrons and holes, respectively. E_0 the thermodynamic value of the emf: $E_0 = (RT/4F) \ln(p_2/p_1)$. Table 1 lists the experimental data. Fig. 2 shows conductivity and ΔE at 1000°C as a function of the CaO content. With rising CaO content in the system $CeO_2 - ZrO_2 - CaO$, the authors found a steady transition from electron to ion conductivity. This effect was not observed in the systems $CeO_2 - CaO$ and $ZrO_2 - CaO$. The authors give the following explanation: As a result of partial reduction of Ce^{4+} to Ce^{3+}, first an intense electron conductivity occurs in the system $CeO_2 - ZrO_2$. Increasing addition of CaO inhibits this reduction more and more, and the ion conductivity caused by oxygen ions takes the place of electron conductivity. A decrease of conductivity in samples containing over 40 mole% CaO is attributed to the accumulation of free CaO not converted into a solid solution. There are 1 figure, 2 tables, and 9 references: 5 Soviet, 3 US, and 1 German.

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84832

Transition From Electron to Ion Conductivity as a Function of the Composition of Solid Solutions of Oxides

S/020/60/134/005/020/023
B004/B064

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR
(Institute of Electrochemistry of the Ural Branch of the Academy of Sciences USSR)

PRESENTED: June 6, 1960 by A. N. Frumkin, Academician

SUBMITTED: June 6, 1960

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40827

24 7900

S/631/61/000/002/009/01·
1003/1203

AUTHORS Pal'guyev, S F , and Volchenkova, Z S

TITLE Electric conductivity of solid oxides IV The CeO_2 BeO. CeO_2 MgO CeO_2, CaO CeO_2-SrO, and CeO_2-BaO systems

SOURCE Akademiya nauk SSSR Ural'skiy filial Institut elektrokhimii Trudy no 2 1961 Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov 157 172

TEXT The electric conductivity of pure solid oxides and of their solid solutions has not been of these substances sufficiently studied, despite the wide industrial application The plot of log $1/T$ is a stright line with inflections at characteristic temperatures for every system Measurements of the electric conductivity of BeO, MgO, CaO, and SrO, between 500 and 1300°C, shows that at elevated temperatures the conductivity rises with temperature according to the relation $\chi = A \exp (sE/2kT)$ The activation energy of the current carriers decreases steadilly with increase in the ionic radius of the cation, i e . with decrease of the lattice energy of the oxide. The electric conductivity of the CeO_2-BeO. CeO_2-MgO, CeO_2-SrO. and CeO_2-BaO systems, measured over a wide range of temperature (300–1000°C) and chemical composition is little dependent on the value of the ionic radius of the bivalent metal This is probably due to the different nature of the current carriers in these two cases The variation of linear shrinkage of the samples on sintering as well as the variation of the electric conductivity of samples with different chemical compositions are probably related to their crystal structure There are 12 figures, and 6 tables

Card 1/1

40828

24.7700

S/631/61/000/002/010/01
1003/1203

AUTHORS Volchenkova, Z. S., and Pal'guyev, S. F.

TITLE Electric conductivity of solid oxides. V. The ZrO_2-BeO, ZrO_2-CaO, ZrO_2-MgO, ZrO_2-SrO, and ZrO_2-BaO systems

SOURCE Akademiya nauk SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no. 2, 1961. Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, 173-183

TEXT The electric conductivity of the above systems was investigated for a wide range of temperature and chemical composition. The conductivity is considerably higher for systems forming solid solutions (ZrO_2-MgO and ZrO_2-Ca). The temperature dependence of the electric conductivity is given by the equation: $\chi = Ae - \Delta E/kT$. The plot of log χ is $1/T$ is a straight line with one or more inflections. The linear shrinkage of samples on sintering was measured, and their applicability as ceramics was investigated. The formation of chemical compounds (calcium, strontium, and barium monozirconates) results in a minimum linear shrinkage and electric conductivity. On the basis of these two criteria a chemical compound with the formula $2SrO.ZrO_2$ is believed to be formed in a mixture containing 65 mole % SrO and 35 mole % ZrO_2. There are 10 figures and 4 tables.

Card 1/1

S/137/62/000/008/015/065
A006/A101

AUTHORS: Pal'guyev, S. F., Yushina, L. D., Ovchinnikov, Yu. M.

TITLE: Investigating oxide sintering by the electric-conductivity method

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 8, 1962, 45, abstract 8G309 ("Tr. In-ta elektrokhimii. Ural'skiy fil. AN SSSR", 1961, no. 2, 193 - 197)

TEXT: The authors studied sintering of CeO_2 with admixtures of BeO (5 mol.%), MgO (10 mol. %), CaO (15 mol. %) and SrO (9 mol. %). Changes in the electric resistivity were determined as functions of the composition, time of holding, and sintering temperature. "Electric resistivity versus sintering time" curves were plotted. The electric resistivity of the specimens (solid solutions) increases in the sintering process. The end of sintering was fixed when constant electric resistivity was established. Specimens of 20 mm in diameter, 12 - 15 mm high, were pressed from a thoroughly crushed oxide mixture (roasted at 1,200°C) at 1,000 kg/cm^2 pressure. To measure electric resistivity Pt-wires were pressed into the specimens; their ends were connected with an a-c bridge. Sintering was con-

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A006/A101

Investigating oxide sintering by...

ducted in a Silit furnace at 1,200, 1,350, 1,450 and 1,550°C for 1 - 15 hours. Linear shrinkage values of the specimens are in agreement with changes in the electric resistivity. It was established that at 1,200 - 1,350°C CeO_2 + SrO mixtures are most rapidly sintered, and CeO_2 + BeO mixtures at 1,450 - 1,550°C. The relative sintering rate of mixtures with additions of CaO and MgO is approximately the same at all temperatures investigated. It is shown that the measurement of electric resistivity can be used as a sensitive method for investigating sintering of oxide ceramic specimens. Hypotheses to explain the mechanism of the (diffusion) process are given.

I. Broknin

[Abstracter's note: Complete translation]

Card 2/2

40829

5.4700

S/631/61/000/002/013/01
1003/1203

AUTHORS Filyayev, A T Pal guyev, S F and Karpachev S V

TITLE Investigation of electrode polarization in solid electrolytes

SOURCE Akademiya nauk SSSR Ural skiy filial Institut elektrokhimii Trudy no 2 1961
Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov 199-209

TEXT There are indications in the literature that the conductivity at elevated temperatures in a solid electrolyte consisting of 15 mole % CaO and 85 mole % of ZrO_2 is almost entirely ionic and supposedly due to the movement of oxygen ions The polarization of the CO + CO_2 (Pt) |solid electrolyte 0 15 CaO 0 85ZrO_2| O_2(Pt) cell was measured by a device containing a potentiometer or an oscilloscope The oxygen electrode was used as the reference electrode because it is not readily polarized The relationship between the anodic polarization of the CO-CO_2 electrode and the polarizing current density is expressed by the equation $\mu = q + b \log i$ where $b \simeq 2.3 RT/F$ for both anodic and cathodic polarization Oscillographic measurements show that, after the current is cut off, the polarization decreases so slowly that it can be correctly measured by means of an oscillograph This is probable due to changes in concentrations caused by inhibition of diffusion or of chemical processes There are 9 figures and 4 tables

Card 1/1

35573

S/076/61/035/002/007/015
B124/B201

26.2520

AUTHORS: Yushina, L. D., Pal'guyev, S. F., and Karpachev, S. V.

TITLE: Study of electrochemical cells with solid electrolytes. I. Temperature dependence of the electromotive force of the cell Ag | AgBr(s) | Br_2, C

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 2, 1961, 342 - 349

TEXT: In the course of the work under consideration the authors measured the emf of the cell mentioned in the title in the range from room temperature to 421°C. The best results were obtained with a U-shaped glass tube, into whose one bend, which served as the cell proper, gaseous bromine was introduced and drawn off on the electrolyte surface. The contact with the bromine electrode in the tube was brought about by a soldered platinum wire. The bromine electrode used was a rodlet of spectrally pure carbon and the electrolyte a cylinder pressed from AgBr. The emf of the cell was measured with a high-resistance potentiometer of the type ППТВ-1 (PPTV-1), equipped with an M-91/A (M-91/A) galvanometer as a zero

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[illegible]

S/076/61/035/002/007/015
B 24/B20

Study of electrochemical cells ...

instrument. The measuring accuracy was ± 0.1 mv at temperatures over 110°C, and about ± 1.0 mv at lower temperatures. Measurement results at different temperatures are illustrated in Fig. 1. In the temperature range from 110 to 421°C the points established experimentally were upon a straight line, whose equation was derived empirically with the aid of the least squares method: $E = (1.1518 - 0.493 \cdot 10^{-3} T) \pm 0.0017$ v (1); at temperatures lower than 110°C the points established experimentally were not on a straight line. According to Ref. [illegible] (E. J. Salstrom, J. H. Hildebrand, J. Amer. Chem. Soc. 52, 4650, 1930), the emf of the cell with liquid AgBr amounts to 0.8056 v at 434°C, while the one according to Eq. (1) is 0.8033 v. By thermodynamic calculations made on the basis of data by A. F. Kapustinskiy (Ref. 8: "Termicheskiye konstanty neorganicheskikh veshchestv" (thermal constants of inorganic substances) M. - L., 1949) 0.9904 v was found for the emf at 25°C, while 1.0049 v was obtained from Eq. (1). These data prove that there exists practically no

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89573

S/076/61/035/002/007/015
B124/B201

Study of electrochemical cells ...

electron conductivity in AgBr in the temperature range from 420 to 100°C. To find out whether the electrical conductivity of solid AgBr was of an electronic nature, the authors measured the transfer numbers of the ions in solid AgBr in bromine (vapor pressure = 168 mm Hg) at room temperature and 93°C, the above described device being used for this purpose also. The electrolyte plates used were pressed by a special equipment between the carbon electrodes. The electrolysis current at 20°C was 0.5 to 1.2 ma and at 93°C it was 1.0 to 5.0 ma. The dissolution of bromine in solid AgBr causes an electron conductivity to appear. The electron conductivity arising in solid AgBr in connection with the bromine dissolution is caused by the motion of positively charged holes in the electric field. Ag- and Br ions and positively charged holes were found in solid AgBr. The mean value of the hole-transfer number is calculated from equation $t_o = (\int_{Br}^{Ag} t_o \, d\mu_{Br})/(\mu^{Ag}_{Br} - \mu^{Br}_{Br})$ (11) (where μ_{Br} denotes the potential of atomic bromine in bromine vapors around the Br-electrode, μ^{Ag}_{Br} and μ^{Br}_{Br} the chemical potential of atomic bromine, dissolved in the crystal around the

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B124/B201

Ag- and Br-electrode, respectively; t_o is proportional to the concentration of atomic bromine dissolved in AgBr: $t_o = kc_{Br}$. The relation $t_o = \left[k(c_{Br}^{Br} - c_{Br}^{Ag})\right] / \left[\ln(c_{Br}^{Br}/c_{Br}^{Ag})\right]$. The relation $t_o = t'_o/\ln(c_{Br}^{Br}/c_{Br}^{Ag})$ (12) is derived, where t'_o is the hole-transfer number in AgBr saturated with bromine at a bromine vapor pressure of 170 mm Hg, and c_{Br}^{Br} is the concentration of dissolved bromine in the immediate neighborhood of the Br electrode; $c_{Br}^{Br} \gg c_{Br}^{Ag}$. It may be stated in this connection that if the solid salt saturated with a metalloid practically exhibits only an electron conductivity, this will not become manifest at very low concentrations of dissolved solid metalloid salt near the metal electrode when measuring the emf; the same holds for dissolution in a solid metal salt.
There are 1 figure and 10 references: 2 Soviet-bloc and 8 non-Soviet-bloc. A reference to English language publications reads as follows: D. L. Hildebrand, W. R. Kramer, R. A. Mac Donald, D. R. Still, J. Amer. Chem. Soc., 80, 4129, 1958.

ASSOCIATION: Institut elektrokhimii, Sverdlovsk (Institute of Electrochemistry, Sverdlovsk)

30706
S/020/61/141/001/020/027
B101/B147

26.2513

AUTHORS: Neuymin, A. D., Karpachev, S. V., and Pal'guyev, S. F.

TITLE: Polarization of some gas electrodes which are in contact with solid electrolytes

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 1, 1961, [illegible]

TEXT: The problem mentioned in the title is said to be completely unexplored. The authors examined platinum - gas electrodes which were applied to a solid solution of 85 mole% of ZrO_2 + 15 mole% of CaO. The production of electrolytes has already been described (Tr. Inst. elektrokhimii Ural'sk. fil. AN SSSR, no. 1, 111 (1960)). To both sides of the electrolyte a suspension of Pt powder in benzene solution of rubber was applied as an electrode, and the binding agent was removed by heat treatment. The electrochemical chain examined first was:
Pt, O_2 | 85 mole% of ZrO_2 + 15 mole% of CaO | O_2, Pt (I). Both platinum electrodes were placed in air; direct current passed through the cell. The potential difference between the electrodes was measured for any amperage. The cell was located in an electric furnace, the temperature

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30706
S/020/61/141/[illegible]
B101/B147

Polarization of some gas ...

which could become constant (measurement with a Pt-PtRh thermocouple). The resistance of the electrolyte was measured with an a-c bridge (3000 cps). At the experimental temperatures 900, 1000, and 1100°C, it was 23.90, 7.[illegible]3, and 3.80 ohms, respectively. A linear relationship was found between current density and the voltage measured at the electrodes. The resistances of the electrolyte calculated from the slope of the straight line showed only slight divergences from the values measured directly. Accordingly, no overvoltage occurred at the O_2 electrode. Then, a Pt,O_2 electrode was exchanged for a Pt, CO + CO_2 electrode (cell II) which produced a noticeable emf, so that no external current source was necessary. Amperage was changed by means of a resistance box. The anodic polarization of the CO electrode around which a flow of 66 vol% of CO + 34 vol% of CO_2 streamed, was then measured. Pure oxygen streamed around the O_2 electrode. The anodic overvoltage was determined from $\eta = E_0 - Ir - IR$ (1). η = absolute value of anodic overvoltage; E_0 = equilibrium value of emf; I = amperage; r = resistance of electrolyte; IR = potential drop in the external circuit. For all of the three temperatures, the linear function $\eta = a + b \log i$ (2) was found (i expressed in a/cm²). Since two electrons participate in the anodic

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Polarization of some gas ...

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B101/B147

of the CO electrode, $b = 2.3RT/2F\alpha$ is written. For a, b, α the following values are given:

	900°C	1000°C	1100°C
b	0.258	0.250	0.260
α	0.45	0.51	0.52
a	1.068	0.953	0.866

At low amperages, the measurement values deviated considerably from linearity. This was ascribed to the polarization countercurrent. The following equations are written:

$\vec{i} = K\exp(\eta F/RT)$ (3); $\overleftarrow{i} = K\exp(-\eta F/RT)$ (4); $\vec{i} = i + \overleftarrow{i}$ (5).
At high overvoltage, $\vec{i} \approx i$, at low overvoltage Eq. (5) is valid. i is the current measured. By using Eq. (4), $\overleftarrow{i}$ was calculated for the measuring points deviating from linearity at low overvoltage, and, by taking $\overleftarrow{i}$ into account, complete linearity could be achieved also for these measuring points. At the CO electrode, a considerable overvoltage ($\eta = 0.6$ v) occurred. Thus, the electrodic reaction is inhibited in spite of the high temperature. Further studies are necessary to explain this effect. There

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30706

Polarization of some gas ... S/020/61/141/002/020/027
B101/B147

are 2 figures, 1 table, and 7 references: 3 Soviet and 4 non-Soviet. The two most recent references to English-language publications read as follows: K. Kuikkola, C. Wagner, J. Electrochem. Soc., 104, 379 (1959); W. D. Kingery, J. Pappis, M. E. Doty, D. C. Hill, J. Am. Ceram. Soc., 42, 393 (1959).

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR (Institute of Electrochemistry of the Ural Branch of Academy of Sciences USSR)

PRESENTED: June 24, 1961, by A. N. Frumkin, Academician

SUBMITTED: April 19, 1961

Card 4/4

X

PAL'GUYEV, S.F.

Measurement of the transfer number in pure fused salts. Trudy Inst. elektrokhim. UFAN SSSR no.3:65-67 '62. (MIRA 16:6)

(Fused salts) (Ions—Migration and velocity)

CHEBOTIN, V.N.; NEUYMIN, A.D.; PAL'GUYEV, S.F.

Electron conduction of ionic crystals in equilibrium with a gaseous phase. Part 2: Solid solution with anti-Frenkel' defects. Trudy Inst. elektrokhim. UFAN SSSR no.3:125-132 '62. (MIRA 16:6)

(Ionic crystals) (Electrons)

NEUYMIN, A.D.; PAL'GUYEV, S.F.

Nature of the conductance of solid oxides. Part 2: Systems $CeO_2 - La_2O_3$, $CeO_2 - Nd_2O_3$, $CeO_2 - Y_2O_3$. Trudy Inst. elektrokhim. UFAN SSSR no.3:133-140 '62. (MIRA 16:6)

(Rare earths--Electric properties)

NEUYMIN, A.D.; PAL'GUYEV, S.F.

Problem of electric conductance and its character in the systems CeO_2 - BeO, CeO_2 - MgO, CeO_2 - CaO, CeO_2 - SrO, CeO_2 - BaO. Trudy Inst. elektrokhim. UFAN SSSR no.3:141-147 '62. (MIRA 16:6)

(Cerium oxides--Electric properties)
(Metallic oxides)

PAL'GUYEV, S.F.; YUSHINA, L.D.

Transfer numbers in the solid oxides of beryllium, magnesium, and calcium. Trudy Inst. elektrokhim. UFAN SSSR no.3:149-154 '62. (MIRA 16:6)

(Metallic oxides—Electric properties)
(Ions—Migration and velocity)

KARPACHEV, S.V.; FILYAYEV, A.T.; PAL'GUYEV, S.F.

Anodic polarization in solid electrolytes. Trudy Inst. elektrokhim. UFAN SSSR no.3:161-164 '62. (MIRA 16:6)

(Electrolytes) (Polarization (Electricity))

STREKALOVSKIY, V.N.; BUROV, G.V.; PAL'GUYEV, S.F.; VOLCHENKOVA, Z.S.;
SAMARINA, V.A.

Relation between electrical and structural properties in the CeO_2 - SrO system. Trudy Inst. elektrokhim. UFAN SSSR no.3: 165-169 '62. (MIRA 16:6)

(Cerium oxides) (Strontium oxide)
(Solutions, Solid—Electric properties)

STREKALOVSKIY, V.N.; BUROV, G.V.; SAMARINA, V.A.; PAL'GUYEV, S.F.;
VOLCHENKOVA, Z.S.

Interaction between CeO_2 and MgO in the solid state. Trudy Inst. elektrokhim. UFAN SSSR no.3:171-177 '62.
(MIRA 16:6)

(Cerium oxides) (Magnesium oxide)
(Solutions, Solid)

S/181/62/004/004/004/042
B108/B102

24.7700

AUTHORS: Pal'guyev, S. F., and Neuymin, A. D.

TITLE: Nature of the high-temperature electrical conductivity of beryllium, magnesium, calcium, and strontium oxides

PERIODICAL: Fizika tverdogo tela, v. 4, no. 4, 1962, 855 - 860

TEXT: In order to obtain new and more accurate data, the authors studied the conduction mechanism in the above oxides. The emf was measured in the temperature range of 900 - 1300°C. The electrical conductivity of BeO, MgO, CaO, and SrO was measured in gaseous media with partial oxygen pressures ranging from pure oxygen to a mixture of 66% by volume of CO plus 34% by volume of CO_2. The emf of a cell $Pt \left| \begin{matrix} O_2 \\ (p_1) \end{matrix} \right| oxide \left| \begin{matrix} O_2 \\ (p_2) \end{matrix} \right| Pt$, as used by the authors, is given by $E_0 = \frac{RT}{4F} \ln \frac{p_2}{p_1}$ (p_1, p_2 = partial pressures of oxygen). If the solid electrolyte has both ionic and electronic conductivity (n- or p-type), the emf of the cell will decrease to

√A

Card 1/2

S/078/62/007/003/011/019
B110/B138

15.2230

AUTHORS: Pal'guyev, S. F., Volchenkova, Z. S.

TITLE: Use of the electrical conductivity method to the study of the nature of interaction among the components of oxide mixtures

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 3, 1962, 519 - 527

TEXT: Using own earlier findings (Zh. fiz. khimii, 34, 452 (1960); Tr. In-ta elektrokhimii Ural'skogo filiala AN SSSR, vyp. 1, 119 (1960); ibid. vyp. 2; Dokl. AN SSSR, 134, 1138 (1960)) the authors state that the conductivity method can be used to detect the formation of chemical compounds. Thus, for $CaZrO_2$, $SrZrO_3$, $BaZrO_3$, $SrCeO_3$, and $BaCeO_3$, low minima were found on the conductivity isotherms and on the curves of linear shrinkage on sintering. It is suggest that the compound $2SrO \cdot ZrO_2$ exists in the system ZrO_2-SrO, as a linear expansion of about 11% occurs on sintering. Thermal and X-ray phase analyses of $2SrO \cdot ZrO_2$ samples would be useful. In many oxide systems the dioxides form cubic solid solutions of

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S/078/62/007/003/011/019
B110/B138

Use of the electrical...

the second kind with imperfect crystal lattice (vacancies in the anion sublattice). The number of vacancies grows with dioxide concentration. Conductivity grows with the number of vacancies until they react with one another. The conductivity peaks of ZrO_2-MgO; ZrO_2-CaO; CeO_2-MgO; CeO_2-CaO; CeO_2-SrO; CeO_2-ZrO_2-CaO with 15 - 25 moles% MeO are dependent on this. In the ZrO_2-MgO system besides the cubic, a monoclinic solid solution (0.4 moles% MgO) was found by electrical conductivity. In ZrO_2-CaO, a solid solution of monoclinic ZrO_2 was found with low CaO concentration. In ZrO_2-CeO_2, the electrical conductivity minimum is determined by the semiconductor properties of the oxides in the solid solution. In CeO_2-ZrO_2-CaO, with 8 moles% CaO, the minimum is related to the transition from electron to ionic conductivity. The capacity for chemical interaction, reduction, and the type of phase are revealed as extreme values on the electrical conductivity - composition isotherms. Their interpretation, together with that of sintering shrinkage, can be used to reveal the very faintest physical properties of the oxides examined.

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Use of the electrical...

S/078/62/007/003/011/019
B110/B138

V. N. Yeremenko (Zh. neorgan. khimii, 1, 2118 (1956)) is mentioned. There are 1 figure and 15 references: 12 Soviet and 3 non-Soviet. The two references to English-language publications read as follows: W. B. Blumenthal. The Chemical Behavior of Zirconium. D. van Nostrand Company Inc. Princeton, New Jersey, Toronto, New York, London, 1958, p. 167; Uei, Nakadzava, Uetsuki. J. Ceram. Assoc. Japan, 64, 139 (1956).

ASSOCIATION: Ural'skiy filial AN SSSR Institut elektrokhimii (Ural Branch AS USSR, Institute of Electrochemistry)

SUBMITTED: March 20, 1961

Card 3/3

S/020/62/143/006/021/024
B152/B102

AUTHORS: Neuymin, A. D., and Pal'guyev, S. F.

TITLE: Study of transference numbers in solid oxides

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 143, no. 6, 1962, 1388-1391

TEXT: In continuation of an earlier paper (Tr. Inst. elektrokhimii UF AN SSSR, no. 3 (1962)), an attempt is made to find out what ions cause electrical conductivity in the systems CeO_2-La_2O_3, CeO_2-Nd_2O_3, and CeO_2-Y_2O_3. Cerium dioxide, lanthanum oxide, neodymium oxide, and yttrium oxide were used as initial materials, from which tablets were pressed and tempered at 1600°C. The contribution of electrons to conductivity was determined by the emf method. The transference number of the cations was calculated from the changes in weight of two tablets serving as an electrode, between which a third tablet was pressed. For the Ce^{4+} ion, the transference number was < 0.004. The experiments

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KARPACHEV, S. V.; FILYAYEV, A. T.; PALGUYEV, S. F.

"Polarization of Oxygen Platinum Electrodes in a 0·85 ZrO_2 0·15 CaO Solid Electrolyte."

Report presented at the 14th meeting CITCE, Intl. Comm. of Electrochemical Thermodynamics and Kinetics, Moscow, 19-25 Aug 63.

Ural Institute of Electrochemistry, Academy of Sciences of U.S.S.R.

L 38507-65 EPF(c)/EPF(n)-2/EPR/EWG(j)/EWA(c)/EWT(1)/EWT(m)/EWG(m)/EWP(b)/T/EWA(d)/
EWP(w)/EWP(t) Pr-4/Ps-4/Pu-4 IJP(c) WW/JD/JG/GS

ACCESSION NR: AT5007729 S/0000/63/000/000/0118/0134 60
59

AUTHOR: Pal'guyev, S. F.; Neuymin, A. D.; Volchenkova, Z. S.; Yushina, L. D. B+1

TITLE: Electrical conductivity 21 of highly refractory 27 oxides 27 at high temperatures

SOURCE: AN SSSR. Institut khimii silikatov. Silikaty i okisly v khimii vysokikh
temperatur (Silicates and oxides in high-temperature chemistry). Moscow, 1963,
118-134

TOPIC TAGS: metal oxide, refractory oxide, oxide conductivity, high temperature
conductivity, rare earth oxide

ABSTRACT: The electrical conductivity of pure 16 oxides and their mixtures was in-
vestigated. The pure oxides were (a) the dioxides of zirconium, thorium and cer-
ium; (b) the oxides of beryllium, magnesium, calcium and strontium; and (c) the
oxides of yttrium, lanthanum, and neodymium. In all these groups, the temperature
dependence of the electrical conductivity was determined and plotted on graphs.
The oxide mixtures consisted of (a) systems of oxides based on zirconium dioxide
(ZrO_2-BeO, ZrO_2-MgO, ZrO_2-CaO, ZrO_2-SrO, ZrO_2-BaO), (b) systems based on thorium
dioxide (ThO_2-BeO, ThO_2-MgO, ThO_2-CaO, ThO_2-SrO, ThO_2-BaO), (c) systems based on

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ACCESSION NR: AT5007729

cerium dioxide (CeO_2-BeO, CeO_2-MgO, CeO_2-CaO, CeO_2-SrO, CeO_2-BaO), and (d) the systems CeO_2-ZrO_2 and ($0.75CeO_2 \cdot 0.25ZrO_2$)-CaO. In all these mixtures, the isotherms of the electrical conductivity at 1000C were plotted. The experimental results lead the authors to the conclusion that the electrical conductivity of solid oxides is sensitive to many of their other properties, such as the tendency to react with one another and with the components of the gas phase and the tendency to be reduced. The conductivity also depends on the nature of the phases present. Orig. art. has: 7 figures and 1 formula.

ASSOCIATION: None

SUBMITTED: 0000063 ENCL: 00 SUB CODE: MT, IC, EM

NO REF SOV: 023 OTHER: 018

Card 2/2

L 38513-65 EPF(c)/EPR/EWG(j)/EWT(m)/EWG(m)/EWP(b)/T/EWA(d)/EWP(w)/EWP(t) Pr-4/
Ps-4 IJP(c) RWH/JD/GS

ACCESSION NR: AT5007741 S/0000/63/000/000/0253/0268 31

AUTHOR: Neuymin, A.D.; Pal'guyev, S.F. B+1

TITLE: Methods of studying the nature of the conductivity of solid oxides 21

SOURCE: AN SSSR. Institut khimii silikatov. Silitaty i okisly v khimii vysokikh temperatur (Silicates and oxides in high-temperature chemistry). Moscow, 1963, 253-268

TOPIC TAGS: solid oxide, oxide conductivity, high temperature conductivity, conductivity measurement, oxygen evolution, oxygen electrode, transference number, oxygen determination

ABSTRACT: The article reports some of the results obtained by the authors in their work on the development of methods for studying electrical conductivity in oxides at high temperatures. Two methods are considered: (1) the emf method and (2) determination of the amount (partial pressure) of oxygen evolved at the anode during electrolysis. The applicability and advantages of each method are discussed. The authors studied oxides or their mixtures in which the presence of oxygen-ion conductivity could be expected to some extent. Oxygen gas electrodes were used in the emf method. Diagrams of the

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ACCESSION NR: AT5007741

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cells used in the latter method and a diagram of the apparatus used for the determination of oxygen evolved during electrolysis of solid oxides with oxygen electrodes are given, and the respective procedures are fully described. Transference numbers of ions determined by both methods for various oxide mixtures are tabulated. Orig. art. has: 5 figures, 7 formulas and 1 table.

ASSOCIATION: none

SUBMITTED: 0000063 ENCL: 00 SUB CODE: IC, EM

NO REF SOV: 011 OTHER: 014

Card 2/2

ACCESSION NR: AT3007157 S/2631/63/000/003/0141/0147

AUTHORS: Neuymin, A. D.; Pal'guyev, S. F.

TITLE: On the electric conductivity and its character in the systems CeO-sub-2-BeO, CeO-sub-2-MgO, CeO-sub-2-CaO, CeO-sub-2-SrO, and CeO-sub-2-BaO

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 3, 1963, 141-147

TOPIC TAGS: conductivity, electric conductivity, character of conductivity, oxygen-ionic conductivity, O-ionic conductivity, vacancy, defect, mixed oxide, oxide, oxygen-ionic vacancy, O-ionic vacancy, Ce, Be, Mg, Ca, Sr, Ba

ABSTRACT: Issuing from the premise that the presence of a significant number of O-ionic vacancies in the lattice of mixed oxides must express itself in a growth of O-ionic conductivity, also from the hypothesis that a comparison of the results of electrical-conductivity (EC) measurements and the study of the character of the conductivity of specimens of such mixtures must provide a basis for conclusions relative to the defectivity of their structures, this paper reports the results of an experimental investigation in which the electromotive-force method, in combination with conductivity measurements, served to study the nature of the conductivity of oxide mixtures of a number of various compositions of the systems CeO_2-BeO,

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ACCESSION NR: AT3007157

CeO_2-MgO, CeO_2-CaO, CeO_2-SrO, and CeO_2-BaO. The e.m.f. method employed a Pt/O/specimen/air/Pt cell. From a comparison of the experimental magnitude of the e.m.f. with the thermodynamically calculated value the following pertinent conclusions on the character of the conductivity of the specimens were made: It is shown that in the systems CeO_2-CaO and CeO_2-SrO the specimens of the compositions investigated (solid solutions with a lattice of the fluorite type) are endowed with significant O-ionic conductivity, whereas the specimens with like composition of the system CeO_2-BeO, CeO_2-MgO, and CeO_2-BaO exhibit a substantially smaller ionic conductivity. A comparison of the absolute magnitudes of EC found with data obtained from a study of its character shows that BeO, MgO, and BaO undergo a measure of dissolution on CeO_2. In this process, O-ionic vacancies form in the crystalline lattice of the mixed oxides, just as they do in the system CeO_2-CaO and CeO_2-SrO, but in a considerable smaller measure. Orig. art. has 2 figures and 2 tables.

ASSOCIATION: Institut elektrokhimii, Ural'skiy filial AN SSSR (Institute of Electrochemistry, Ural Branch, AN SSSR)

SUBMITTED:	00	DATE ACQ:	12Jul63	ENCL:	00
SUB CODE:	CH, PH, EL	NO REF SOV:	012	OTHER:	000

Cord 2/2

ACCESSION NR: AT4008734 S/2631/63/000/004/0067/0081

AUTHOR: Volchenkova, Z. S.; Pal'guyev, S. F.

TITLE: Electrical conductivity in solid oxides. 7. Systems ThO_2-BeO, ThO_2-MgO, ThO_2-SrO, and ThO_2-BaO

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 4, 1963. Elektrokhimiya rasplavlenny*kh solevy*kh i tverdy*kh elektrolitov, 67-81

TOPIC TAGS: refractory oxide, electric ceramic, mixed oxide, solid oxide, thoria, thorium oxides, beryllia, beryllium oxide, alkaline earth oxides, magnesia, strontium oxide, barium oxide, ThO sub 2-BeO system, ThO sub 2-SrO system, ThO sub 2-MgO system, ThO sub 2-BaO system, ceramic oxide property, metal oxide system

ABSTRACT: The electrical conductivity at 300-1000C was studied in varying quantitative combinations (from pure ThO_2 to pure MeO) of the above systems. The procedure was the same as described in the previous papers on the subject (Trudy* Instituta Khimii UFAN, No. 2, 1958, no. 1, 1960, no. 2, 1961, and Zhurnal Fizicheskoiy Khimii, 1960, 34, 452). The systems ThO_2-BeO and ThO_2-MgO give some indications of slight solubility of BeO and MgO in ThO_2 and the formation of the chemical compound $MgO \cdot ThO_2$ may take place in the system ThO_2-MgO.

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ACCESSION NR: AT4008734

MeO-additions up to 15 mol % enhance the conductivity by approximately one order in the systems ThO_2-SrO and ThO_2-BaO, intensify the color of samples and cause their contraction, which suggests the possible formation of solid solutions. It was shown that the formation of $BaThO_3$ produces a deep linear contraction minimum during the thermal agglomeration of samples and also produces a conductivity minimum. The considerable diminution of contraction and the course of the specific conductivity isotherms suggest the existence of the compounds $BaTh_3O_7$, $SrThO_3$, and Sr_2ThO_4 in the combinations 0.25 BaO·0.75 ThO_2, 0.5 SrO·0.5 ThO_2, and 0.7 SrO·0.3 ThO_2. Orig. art. has: 10 graphs and 4 tables.

ASSOCIATION: Institut elektrokhimii, Ural'skiy filial AN SSSR (Electrochemical Institute, Urals Branch, AN SSSR)

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ACCESSION NR: AT4008736 S/2631/63/000/004/0091/0095

AUTHOR: Yushina, L. D.; Pal'guyev, S. F.

TITLE: Transference numbers in the systems CeO_2-BeO, CeO_2-MgO, CeO_2-CaO, and CeO_2-SrO

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 4, 1963. Elektrokhimiya rasplavlenny*kh solevy*kh i tverdy*kh elektrolitov, 91-95

TOPIC TAGS: refractory oxide, electric ceramic, cerium oxides, CeO sub 2, beryllium oxide, alkaline earth magnesium oxide, calcium oxide, strontium oxide, A sub 2 + B sub 4 + O sub 3 compound, Sr Ce O sub 3 mixed oxides, solid solution electrolysis, oxide electrical conductivity, transport number, transference number

ABSTRACT: The purpose of the work was to verify the recent surmise (Trudy* Instituta Elektrokhimii UFAN SSSR, no. 3, Sverdlovsk, 1962, 141) that during electrolysis of the above systems oxygen ions are solely mobile and solid solutions are formed. To achieve this, the transference numbers of the cations involved have been measured. The authors' modified gravimetric method was applied which is described in detail in earlier papers (ib. 149 and DAN SSSR, 1962, 143, 1388). The 26 tests were conducted at 1100 ± 10° in an atmosphere of air. A 1.6 v current

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ACCESSION NR: AT4008736

was used. The CeO_2 molecular percentage in the samples varied from 50 to 98. The quantity of electricity passed through individual samples varied from 1.41 to 4.266 amp.-hr. To eliminate contingencies, blank tests were made, identically treated minus electrolysis. It was found in all cases that the ionic component of conductivity for all tested combinations of CeO_2-MeO (Me stands for Be, Mg, Ca or Sr) is related to the mobility of oxygen ions. The data obtained confirm an earlier assumption of the formation of solid solutions in the system CeO_2-BeO. Orig. art. has: 1 formula and 4 tables.

ASSOCIATION: Institut Elektrokhimii, Ural'skiy filial AN SSSR (Electrochemical Institute, Urals Branch, AN SSSR)

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Card 2/2

ACCESSION NR: AT4008737 S/2631/63/000/004/0097/0110

AUTHOR: Neuymin, A. D.; Pal'guyev, S. F.; Chebotin, V. N.

TITLE: Reduction of cerium dioxide in the CeO_2- La_2O_3 mixture and electrical conductivity of the mixtures

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 4, 1963. Elektrokhimiya rasplavlenny*kh solevy*kh i tverdy*kh elektrolitov, 97-110

TOPIC TAGS: refractory oxide, high temperature ceramic, cerium oxides, cerium dioxide, Ce 0 sub 2, Ce 0 sub 1.5, lanthanum oxides, La sub 2 0 sub 3, La 0 sub 1.5, Ce 0 sub 2 - La sub 2 0 sub 3 system, Ce 0 sub 2 - La sub 2 0 sub 3 crystals, rare earth oxides

ABSTRACT: Reducibility and electron conductivity of the system CeO_2-La_2O_3 was studied in relation to temperature, content of La_2O_3 and the composition of the gaseous phase with which the crystals in question were in a state of thermodynamic equilibrium. A mixture of gaseous CO and CO_2 was used as the reducing agent. The study emphasized temperatures above 700C and reduction of solid solutions with anionic vacancies (i.e. mixtures containing up to 60 mol% $LaO_{1.5}$) and related, broadly speaking, to use of cerium dioxide based ceramics at very high temperatures. Reducibility was studied by means of equipment shown (see Fig. 1 in the

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