CHIZHIKOV, D.M.

AID P - 917

Subject : USSR/Chemistry

Card 1/1 Pub. 152 - 8/22

Authors : Chizhikov, D. M. and Smirnov, M. P.

Title : Removal of zinc from lead-zinc alloys by the vacuum method

Periodical : Zhur. prikl. khim., 27, no. 5, 514-526, 1954

Abstract : The optimum temperature for this process is 600°C. At that temperature the highest amount of zinc can be extracted (96-98%), and the condensate contains the lowest amount of lead (0.03-0.07% of the initial amount). Seven tables, 14 diagrams, 3 references (2 Russian: 1935-1951).

Institution : State Institute of Nonferrous Metals

Submitted : Ja 17, 1953

CHIZHIKOV, D.M.

USSR/Chemistry -- Metals

FD-2627

Card 1/1 : Pub. 41-13/21

Author : Kreyngaus, B. P. and Chizhikov, D. M., Moscow

Title : On the mechanism of the reaction of oxidizing cobalt, in solution, with ozone.

Periodical : Izv. AN SSSR, Otd. Tekh. Nauk 4, 141-142, Apr 1955

Abstract : Describes tests whereby cobalt, in solution, is oxidized with ozone. Concludes that the reaction is ionic with a simultaneous hydrolytic separation of cobalt. Photograph of test apparatus. Three USSR references.

Institution :

Submitted : February 25, 1955

USSR/Engineering - Metallurgy FD-2930

Card 1/1 Pub. 41-11/17

Author : Chizhikov, D. M., Gulyanitskaya, Z. F. and Bogovarova, N. N., Moscow

Title : Electrical and thermal conductivity of certain copper nickel sulfide alloys

Periodical : Izv. AN SSSR, Otd. Tekh. Nuak, 6, 109-113, June 1955

Abstract : A study of the compositions of alloys of copper, nickel and iron sulfides. Presents relationships between amount of iron and the specific electroconductivity and thermal conductivity of the copper-nickel mattes. Tables, graphs, formulae. One reference, USSR.

Institution :

Submitted : February 25, 1955

GVELESIANI, G.G.; KONYSHKOVA, T.Ye.; CHIZHIKOV, D.M.

Kinetics of the carbon monoxide reduction of copper oxide.
Izv. AN SSSR. Otd.tekh.nauk no.8:140-144 Ag '55. (MLRA 9:1)

(Copper oxide) (Carbon monoxide) (Reduction, Chemical)

USSR/Engineering - Metallography FD-3029

Card 1/1 Pub. 41 - 13/15

Author : Kreyngauz, B. P. and Chizhikov, D. M., Moscow

Title : On the effect of oxygen and the role of sodium sulfite in the process of the cementation of cobalt from solution by metallic zinc.

Periodical : Izv. AN SSSR, Otd. Tekh. Nauk 9, 167-169, Sep 55

Abstract : Presents the results of a study on the effect of dissolved oxygen and the role of sodium sulfite on the cementation of cobalt from a solution of its sulfate by metallic zinc. Describes experiments conducted. Line drawing depicts set-up. Concludes that dissolved oxygen has a negative effect on the rate and degree of cementation of cobalt. Graphs. Five references, 4 USSR.

Institution:

Submitted : May 3, 1955

2

chem

The Interaction of Metallic Nickel with Sulphur Dioxide. Yu. V. Rumyantsev and D. M. Chizhikov (*Izvest. Akad. Nauk S.S.S.R.*, 1956, [Tekhn.], (10), [illegible]).—[In Russian]. Reaction takes place on the basis 7Ni + 2SO$_2$ ⇌ Ni$_3$S$_2$ + 4NiO. The temp. where intensive reaction begins is from 460° to 470° C., and the max. rate of reaction takes place at 800°–900° C. A further increase of temp. decreases the rate of reaction. There may be secondary reactions leading to the formation of normal and basic sulphates. The secondary products slow down further reaction but are unstable and decompose in the course of reaction and with increasing temp. Reverse reaction between the sulphide and oxide of Ni is possible at temp. > 800° C. The partial vapour-pressure of SO$_2$ at the temp. of roasting (800°–1100° C.) is 60–70 mm. Hg. The reaction is quite intensive in the initial stages, and the dependence of its rate on temp. is suitably expressed by the empirical formula $W = 0.9909 \cdot 10^{-4}$ [illegible]. An increase in the rate of formation of Ni at temp. 1100°–1200° C. is obtained by extracting the SO$_2$ from the reaction chamber.

N. E. B.

3402* Mechanism of Reduction of Magnesium Oxide by Carbon. O mekhanizme vosstanovleniia okisi magniia uglerodom. (Russian.) B. S. Gulianitskii and D. M. Chizhikov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 11, Nov., p. 13-24.

Relation of reduction rate to pressure of CO; volatility of MgO in vacuum and in A atmosphere; effect of temperature on reaction speed in CO and in vacuum. Graphs. 30 ref.

2

Metl

Chizhikov, D.M.

GUROVICH, N.A.; CHIZHIKOV, D.M.; DENISOVA, G.M.

Hydrolysis of solutions of indium sulfate. Trudy Inst. met. no.2: 78-86 '56. (MIRA 10:11)

(Indium sulfate) (Hydrolysis)

[illegible]

[illegible]

MT

Reaction of iron, nickel, and cobalt sulfates [illegible]
[illegible] and [illegible] M. Chizhikov [illegible]
[illegible] Metal. 20 [illegible]
[illegible] total [illegible]
[illegible] of Fe 46.5 and [illegible] placed [illegible]
inserted [illegible] reaction tube and washed with N [illegible]
was placed in a furnace and heated [illegible]
[illegible] connected to the [illegible]
[illegible] with N into the [illegible]
[illegible] that require [illegible]
[illegible] used. The sulfides [illegible]
[illegible] sulfates [illegible]
[illegible] S increased [illegible]
[illegible] while for Fe the figures were [illegible]
[illegible] FeS and [illegible]

[illegible]

CHIZHIKOV, D.M.

USSR/Physical Chemistry - Surface Phenomena. Adsorption. Chromatography. Ion Exchange, B-13

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61207

Author: Chizhikov, D. M., Al'tshuler, O. V.

Institution: None

Title: On Adsorption of Selenium on Activated Ca[illegible]ns

Original Periodical: Zh. fiz. khimii, 1956, 30, No 1, 220-222

Abstract: Study by means of γ-radioactive Se^{75} of Se adsorption under dynamic conditions on activated carbon AG and KAD from mixture of Se and S vapors in argon, obtained by evaporation of Se-S melts containing 0.016-5% Se. In all instances the Se/S ratio at the adsorbent is 2.5-3 times greater than in the melt and 5-6 times greater than in the vapors. With increase of temperature adsorption of Se decreases sharply. On desorption S is removed more completely. 15-20% Se are not removed even on heating to 1,000° and by action of different solvents: Na_2S, pyridine, H_2SO_4, HNO_3 and alkali[illegible] this portion of

Card 1/2

USSR/Physical Chemistry - Surface Phenomena. Adsorption. Chromatography. Ion
Exchange, B-13

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61207

Abstract: Se is irreversibly chemosorbed or forms a solid solution of Se in carbon. The main portion of Se is adsorbed physically.

Card 2/2

Chizhikov, D.M.

AUTHOR: Pakhomova, G.N. and Chizhikov, D.M. 285

TITLE: Influence of the anode material on the electrode deposition of cadmium. (Vliyanie materiala anoda na elektroosazhdenie kadmiya.)

PERIODICAL: "Tsvetnye Metally" (Non-ferrous Metals), 1957, No. 1, pp. 46 - 49, (U.S.S.R.)

ABSTRACT: The investigation described had the object of finding conditions for the electrolytic production of cadmium with the total content of impurities not exceeding 0.01%. For this degree of purity the material of the anode is important, and lead-containing anodes were found to be unsatisfactory. Suitable anode materials were found to be 14% silicon cast iron. With such electrodes the optimal conditions for the electrolysis with pure electrolytes are current density at the cathode of 60 amps. per sq. m, temperature 35 °C and lower cadmium-concentration limit 20-30 grams per litre. Under these conditions, the anode consumption rate is 0.009 grams per ampere/hour. Impurities in the electrolyte should not exceed the following values: 1 mg/litre Cu, 20g/litre Zn, 3 g/litre Fe, 1 g/litre Ni, 0.5 g/litre Co, 0.3 g/litre Tl and 12 g/litre Mn. Oxidation of impurities does not occur on silicon-iron anodes, and for this reason the presence in the electrolytes of manganese, iron, chlorine and thallium ions does not decrease the yield of cadmium.
There are 3 references, of which 2 are Russian.

Chizhikov, D.M.

137-1957-12-23524

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 98 (USSR)

AUTHORS: Kovylina, V. N., Chizhikov, D. M.

TITLE: An Investigation of the Anodic Polarization of Alloys of the Sulfides of Copper, Lead, Zinc, and Iron (Issledovaniye anodnoy polyarizatsii splavov sul'fidov medi, svintsa, tsinka i zheleza)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 70-77

ABSTRACT: A study of the anodic polarization of the sulfides of Pb and Zn, as well as of certain alloys of the sulfides of Cu, Pb, Zn, and Fe. The potential was measured by the compensation method by means of a PPTV potentiometer. A saturated calomel electrode served as one of the half-elements, whereas the other one was composed of the alloy being studied, immersed in an appropriate solution. The sulfides of Cu, Pb and Fe were obtained by heating the mixtures of the pure metals and S. The powdered sulfides were then melted in a Silit furnace and held at their melting temperatures for a period of two hours. The alloys of the sulfides were prepared by fusing mono-metallic sulfides. Anodes of 20 x 25 x 5 mm were cast with the sulfides of the alloys and Pb.

Card 1/2

137-1957-12-23524

An Investigation of the Anodic Polarization of Alloys (cont.)

sulfide. The temperature of fusion was 1200°. The cooling was accomplished in air. The changes in the potential were determined with the following D_a values: 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700 a/m^2. The potential was measured 1 min after the given D had been established. It was established that an increase in the temperature displaces the potential of the sulfide alloys in the direction of the electronegative values and moves the potential jump into the area of the higher D's. The anodic dissolution of the ternary alloys of the sulfides of Cu, Pb, and Zn should be performed at a temperature of 50° and with a value of D not exceeding 250-300 a/m^2. The electrolysis of the quaternary alloys of Cu, Pb, Zn, and Fe should be performed at a temperature of 50° and a D which does not exceed 500 a/m^2.

G. S.

1. Copper sulfides alloys-Anodic polarization 2. Lead sulfides alloys-Anodic polarization 3. Zinc sulfides alloys-Anodic polarization 4. Iron sulfides alloys-Anodic polarization

Card 2/2

Chizhikov, D. M.

137-1957-12-23472

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 92 (USSR)

AUTHORS: Pliginskaya, L. V., Chizhikov, D. M.

TITLE: Investigation of the Cathodic Polarization of Nickel in Sulfate Solutions (Issledovaniye katodnoy polyarizatsii nikelya v sul'fatnykh rastvorakh)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 78-84

ABSTRACT: A presentation of the results of an investigation of the cathodic polarization during the precipitation of Ni from sulfate solutions as a function of the temperature, the pH of the solution, the concentration of the metal, and the presence of Cl ions in the electrolyte. The initial solution was prepared with highly purified electrolytic Ni (99.99 percent Ni). The cathodic polarization was measured at D = 20 - 400 a/m^2, while thick Ni precipitate was observed; the pH of the solution varied from 1 to 6. The greatest variation of the potentials was observed at a pH of 2.5 - 4.5 (140 mv out of 170 mv), whereas at a pH of 4.5 - 6.3 the change in polarization was rather small and constituted approximately 30 mv. The addition of 30 g/lit of Cl ion lowered the

Card 1/2

137-1957-12-23472

Investigation of the Cathodic Polarization of Nickel (cont.)

polarization by 20 mv. The influence of the NaCl on the extent of the polarization is more pronounced in the presence of boric acid. If no boric acid is present and the 30, 40, and 60 g/lit Nickel solutions are in the form of $NiSO_4$, the polarization of Ni diminishes with increasing concentration of Ni in the solution. Raising the concentration of Ni from 30 to 60 g/lit. at $D=200\ a/m^2$, reduces the polarization by 30 mv. Adding 5 g/lit boric acid to a solution containing 50 g/lit of Ni, at a temperature of 60° and a pH of 5.7, increases the polarization by 25 mv; an addition of 20 g/lit boric acid, at $D=200\ a/m^2$, increases the cathodic polarization by 75 mv.

G. S.

1. Nickel-Cathodic polarization 2. Sulfate solutions-Applications

Card 2/2

Chizhikov, D.M.

137-1957-12-23487

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 93 (USSR)

AUTHORS: Ryabov, V. A., Zviadadze, G. N., Al'tshuler, O. V., Chizhikov, D. M.

TITLE: The Reaction of Titanium With Its Tetrachloride (Vzaimodeystviye titana s yego tetrakhloridom)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 85-92

ABSTRACT: A study of the conditions necessary for the formation of the lowest chlorides produced by the reaction of Ti with $TiCl_4$. Twice-distilled $TiCl_4$ was employed in the experiments. The powdered Ti, a metal obtained by means of magnesium-thermal process followed by vacuum distillation, contained 99.7 percent Ti. The partial pressure of the $TiCl_4$ was computed from its loss in the vessel and from the volume of Ar passed in the course of the experiment. The purification of Ar was accomplished by passing it through a layer of Ti-sponge heated to a temperature of 700° - 800°. Prior to the introduction of the $TiCl_4$ vapors, Ar was blown through the cold reaction tube. The furnace was then turned on and the $TiCl_4$ was introduced into the tube after the necessary experimental temperature was reached. After the

Card 1/2

137-1957-12-23487

The Reaction of Titanium With Its Tetrachloride

completion of the reaction, the reaction products were extracted from the tube in an Ar stream and were then investigated. It was established that the reaction of Ti with $TiCl_4$ is affected by the temperature and by the partial pressure of $TiCl_4$. At temperatures between 300 and 500° the reaction produces $TiCl_2$, whereas higher temperatures produce $TiCl_3$ along with $TiCl_2$. The most likely reaction between Ti and $TiCl_4$ in the range investigated (300 - 900°) is described by the formula:

$$Ti + TiCl_4 = TiCl_2$$

G. S.

1. Titanium reaction 2. Tetrachloride-Applications

Card 2/2

CHIZHIKOV, D.M.

137-1957-12-23279

Translations from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 60 (USSR)

AUTHORS: Chizhikov, D.M., Zviadadze, G.N., Al'tshuler, O.V.

TITLE: On the Evaporation of Selenium From Its Sulfur Alloys (Ob isparenii selena iz yego splavov s seroy)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 93-100

ABSTRACT: A presentation of experimental results of an investigation of the rate of evaporation of Se from its S alloys, as well as on the condensation of Se from a vapor phase composed of Se and S. Synthetic alloys of S and Se were employed in the experiment; they were obtained by adding appropriate quantities of both stable and active Se to molten S, while the latter was being constantly stirred. The measurement of the evaporation rate of the components of the S-Se alloys was carried out within a temperature range of 98-400°, both under atmospheric pressure and in a vacuum. The rate of evaporation of S and of Se in their alloys increases with temperature. In the sublimation of the solid alloy at 98° the composition of the vapor corresponds to the composition of the solid phase. In the evaporation of the liquid alloy the vapor phase contains approximately one-half as much Se as

Card 1/2

137-1957-12-23279

On the Evaporation of Selenium From Its Sulfur Alloys

the liquid phase. During the distillation of the alloy at low temperatures (under vacuum) and at higher temperatures (under atmospheric pressures) the ratio of the separation remains approximately constant (C_{alloy}/C_{vapor} = 1.3-2). On the strength of the data obtained it was concluded that complex, polyatomic molecules, containing atoms of both components, are formed in the alloys of S and Se.

G. S.

1. Sulfur alloys-Selinium separation 2. Separation-Test methods
3. Separation-Test results

Card 2/2

CHIZHIKOV, D.M.

137-1957-12-23295

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 63 (USSR)

AUTHORS: Chizhikov, D. M., Ustinskiy, B. Z.

TITLE: The Isotope Exchange of Sulfur in the Fusion of the Sulfides of Metals (Izotopnyy obmen sery pri splavlenii sul'fidov metallov)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 101-103

ABSTRACT: For the purposes of studying the isotope exchange, radioactive S in the form of a sulfide of Cu was employed. The radioactive sulfides of alloys were prepared by fusing together the radioactive Cu sulfide with Fe sulfide (at a temperature of 1200° and an exposure of 30 minutes) or of Ni (at 1000° with 30 minutes of exposure). The extraction of Fe sulfide from alloys of Fe and Cu sulfides, and of Ni sulfide from Ni and Cu sulfide alloys was accomplished by treatment with H_2SO_4 (50 g/lit) for different periods of time, namely, 30, 45, and 60 minutes. In the fusion process of the sulfide of Fe with the sulfide of Cu at 1200° during a time interval of 30 minutes, the isotope exchange was found to be 82 percent, whereas during the fusion of the sulfide of Ni with the sulfide of Cu at 1000°, during a period of 30 minutes, the isotope exchange was found to be 50-54 percent. G. S.

Card 1/1

1. Metal sulfides-Fusion 2. Sulfur-Isotope exchange

CHIZHIKOV, D.M.

137-1958-1-133

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 1, p 20 (USSR)

AUTHORS: Kitler, I. N., Chizhikov, D. M., Kovyakina, N. A.

TITLE: Pelletizing of Fusion Mixtures of Nepheline as a Method of Preparing Them for Sintering in a Boiling Layer (Granulyatsiya nefelinovykh shikht kak metod podgotovki ikh k spekaniyu v kipyashchem sloye)

PERIODICAL: Tr. Instituta metallurgii, AN SSSR, 1957, Nr 2, pp 20-36

ABSTRACT: Experiments in pelletizing (P) were run with two mixtures, comprising Uzhur or Kola nepheline concentrates and limestone of the Pikalevsk quarry. P was performed in equipment consisting of a stationary, flat-bottomed metal bowl, heated from beneath and equipped with a device for mechanical raking of the charge. Results in P without heating showed that in order to obtain pellets of optimum size (1-3 mm), the initial moisture content of the fusion mixture should be 16.5 percent. An increase in moisture content results in larger lumps. The optimum duration of the P process is 15 min. An increase to 30 min results in mechanical breakdown to smaller sizes of the pellets initially formed. The same result follows from an increase in

Card 1/2

137-1958-1-133

Pelletizing of Fusion Mixtures of Nepheline (cont.)

the stirrer rpm (>45 rpm). The mechanical strength of the air-dried pellets also depends upon the degree to which the mixture is moistened on P, the maximum strength corresponding to the optimum moisture level. Heating of the pellets to 500° brings virtually no change in their strength. A considerable increase in the mechanical strength of the pellets occurs at 700-1100°. This is explained by the fact that along with the dissociation of the carbonate, there is a chemical reaction between the components of the mixtures to form compounds such as sodium and calcium aluminates, etc. Experiments in P with heating show that employment of heating and mechanical agitation makes possible P of material having an initial moisture content of up to 40 percent, which is brought down to approximately 10 percent in the process regardless of its initial level.

A. Sh.

1. Sintering 2. Pellets--Production

Card 2/2

CHIZHIKOV, D.M.

137-1958-1-134

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 1, p 21 (USSR)

AUTHORS: Chizhikov, D. M., Rumyantsev, Yu. V.

TITLE: Rate of Oxidation of Grains of Nickel Converter Matte Under the Conditions Obtaining in a Boiling Layer (Skorost' okisleniya zeren nikelevogo faynshteyna v usloviyakh kipyashchego sloya)

PERIODICAL: Tr. In-ta metallurgii. AN SSSR, 1957, Nr 2, pp 37-41

ABSTRACT: The experimental procedure was as follows. The furnace was heated to the required temperature, and a rising flow of gas was produced in the shaft furnace, whereupon the matte batch was charged into the bell. Timing of the experiment started at this point. The investigation revealed the following: The oxidation process proceeds at satisfactory speed for the first 30-60 minutes, after which it slows or ceases entirely. Reduction in the size of the matte pellets considerably accelerates oxidation. An increase in O_2 in the gas phase, intensifying oxidation in the initial period, does not improve the ultimate indices of the roasting process. The level of desulfurization diminishes in the case of the large fractions (-48+150 mesh) when the air is enriched by oxygen. Converter matte broken up by pulverization by a stream of O_2

Card 1/2

137-1958-1-134

Rate of Oxidation of Grains of Nickel Converter Matte (cont.)

oxidizes considerably more slowly than converter matte of the same size pulverized mechanically. The reduction in the speed of oxidation of the converter matte as roasting time and O_2 concentration in the gas phase increase may be explained by the high density of the layer of oxides, impairing the access of O_2 to the reaction zone and the removal of gaseous reaction products.

A. Sh.

1. Furnaces--Operation 2. Ores--Processing--Test results

Card 2/2

CHIZHIKOV, D.M.

137-1958-3-4876

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 3, p 60 (USSR)

AUTHORS: Gvelesiani, G.G., Chizhikov, D.M., Konyshkova, T. Ye.

TITLE: The Effect of Temperature on the Kinetics of the Reduction of Cupric Oxide by Carbon Monoxide (Vliyaniye temperatury na kinetiku vosstanovleniya okisi medi okis'yu ugleroda)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 47-55

ABSTRACT: **Results are described of experiments carried out in order** to determine the effect of temperature on the kinetics of the reduction of CuO by CO. The experiments were performed in a vacuum system equipped with automatic pressure regulation of the continuously circulating reducing agent (CO) and capable of recording the progress of the reduction reaction by means of continuous weighings performed on electromagnetic scales. CuO was subjected to reduction under the following conditions: CO pressure: 50, 100, 300, and 450 mm Hg; temperature: 150°, 175°, 200°, 225°, 300°, 400°, 500°, 600°, 700°, and 800°. A temperature increase up to 300°, at a constant pressure of the reducing agent, increases the speed of the reduction reaction of CuO; any further increase in temperature has virtually no

Card 1/2

137-1958-3-4876

The Effect of Temperature on the Kinetics of the Reduction (cont.)

effect on the speed of the reaction. X-ray analysis of partially reduced CuO shows that the reaction progresses in stages and is accompanied by the formation of Cu_2O.

A. P.

Card 2/2

SOV/137-58-9-18455

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 39 (USSR)

AUTHORS: Gulyanitskaya, Z. F., Chizhikov, D. M., Bogovarova, N. N.

TITLE: Electrical Conductivity and Heat Conductivity of Alloys of the Sulfides of Lead, Copper, Zinc, and Iron (Elektroprovodnost' i teploprovodnost' splavov sul'fidov svintsa, medi, tsinka i zheleza)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 54-64

ABSTRACT: The electrical conductivity and heat conductivity of single synthetic (Cu_2S, PbS, and ZnS), binary, ternary, and quaternary alloys of these sulfides, including also FeS and likewise of industrial mattes were investigated in relation to their composition at 20°C. The electrical conductivity γ of FeS, Cu_2S, and PbS constitutes respectively 3.78, 370.0, and 1050.0 mho/cm. For the Cu_2S-PbS alloys the lowest value for γ corresponds to the eutectic composition of the alloy (40% PbS and 60% Cu_2S) and equals 7 mho/cm. For the Cu_2S-FeS alloys γ increases with an increase in the Cu_2S content. The addition of ZnS to various alloys has a different effect on their γ. The addition of FeS to

Card 1/2

SOV/137-58-9-18455

Electrical Conductivity and Heat Conductivity (cont.)

Cu_2S-PbS alloys increases their γ. The value for γ for alloys of the four sulfides and of the industrial mattes are close to the values of obtained for binary and ternary sulfides. The variation in the heat conductivity in relation to the composition is analogous to the variation in γ.

G. F.

1. Metal sulfides--Conductivity 2. Copper-sulfides--Metallurgical effects
3. Iron-sulfides--Metallurgical effects 4. Lead-sulfides--Metallurgical effects
5. Zinc-sulfides--Metallurgical effects

Chizhikov, D.M.

137-1958-3-4652

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 3, p 27 (USSR)

AUTHORS: Tsvetkov, Yu. V., Chizhikov, D. M.

TITLE: On the Kinetics of the Reduction of an Oxide of Lead by an Oxide of Carbon (O kinetike vosstanovleniya okisi svintsa okis'yu ugleroda)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 65-67

ABSTRACT: Experiments were carried out in a vacuum installation with continuous circulation and continuous automatic regulation of the pressure of the reducing agent (CO), as well as with a trap containing N_2, in which the forming CO_2 was frozen out. Experiments showed that the reduction of PbO is detectable at 400° and at a CO pressure of 300 mm Hg. The speed of the process increases with temperature and with increasing pressure of the reducing agent. Thus, within a 10 min period at 300 mm Hg of CO pressure, and at temperatures of 500°, 600°, 700°, and 800°, the PbO is reduced by 5.6 percent, 22.3 percent, 75 percent, and 100 percent, respectively. At 700° and CO pressures (in mm Hg) of 25, 500, 100, and 300, 35 percent, 43 percent, 75 percent, and 100 percent of PbO, respectively, were reduced.

Card 1/2

137-1958-3-4652

On the Kinetics of the Reduction of an Oxide of Lead (cont.)

It is noted that under conditions of shaft furnace smelting of Pb, the reduction of structurally free PbO should be completed in the upper zones of the furnace.

A. P.

Card 2/2

Chizhikov, D. M.

137-1958-2-2605

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 57 (USSR)

AUTHORS: Gurovich, N. A., Chizhikov, D. M., Denisova, G. M.

TITLE: Hydrolyzing Indium-Sulfate Solutions (Gidroliz rastvorov sernokislogo indiya)

PERIODICAL: Tr. in-ta metallurgii AN SSSR, 1957, Nr 2, pp 78-86

ABSTRACT: A study was made of a process of hydrolytic precipitation of In from pure solutions and from solutions containing ions of Zn, Cd, Cu, As, and Al. Two investigative procedures were used: an equilibrium method and a dynamic method (potentiometric titration). The pH value for the complete precipitation of In from sulfuric solutions was determined as a function of the temperature. At 25° the pH value equalled 4.85, at 45° 4.79, at 65° 4.67. The hydrolysis constants were computed, and from these it followed that in the In concentration range under study, hydrolysis of the In sulfate solution at 25° was accompanied by the formation of a basic salt; when it occurred at 45° and 65°, a hydroxide formed. The presence of Cd, Zn, Cu, As^{3+}, and Al did not cause a shift in the pH for In precipitation when the solutions

Card 1/2

137-1958-2-2605

Hydrolyzing Indium-Sulfate Solutions

were hydrolyzed. When As^{5+} ions were present, the pH value for In precipitation declined because of the formation of a chemical compound of the arsenate type. The presence in the solutions of Al increased the consumption of the precipitating agent, since the pH value of the Al was very close to that of the In.

I. B.

1. **Indium sulfate solutions--Hydrolysis**

Card 2/2

137-1958-2-2647

Chizhikov D.M.

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

AUTHORS: Tratsevitskaya, B.Ya., Trusova, V.G., Chizhikov, D.M., Korsunskaya, V.N.

TITLE: Separating Niobium and Titanium in the Form of Complex Chlorides (Razdeleniye niobiya i titana v vide khloridnykh kompleksov)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 87-91

ABSTRACT: In connection with the problem of purifying the separate components of a chloride condensate obtained by chlorinating loparite [Transl.Ed.Note: A mineral of the perovskite group ($CaTiO_3$) in which the Ti^{4+} is replaced by Nb^{5+} and Fe^{3+} and the Ca^{2+} is replaced by Ce^{2+} and Na^{+}; sp. gr. 4.88; color dk. brown; usually isotropic; found in alkaline rocks] concentrates, a study was made of the behavior of complex chloride Nb and Ti salts with K and NH_4 in HCl solutions saturated with HCl (gas) at temperatures of 0° and −10°. The Ti concentration varied from 0.3 to 5 grams per liter, the Nb concentration from 5 to 15 g/ℓ, the Ti-Nb ratio from 1:1 to 1:150. The precipitating agent, KU or NH_4Cl, was added in an amount which exceeded by 40 percent the

Card 1/2

137-1958-2-2647

Separating Niobium and Titanium in the Form of Complex Chlorides

stoichiometric requirement. Precipitation last 72 hours. From the solution containing 1 g/l of Ti in the form of $(NH_4)_2TiCl_6$ it was possible at 0° to precipitate 96 percent of the Ti. Precipitation thoroughness decreased as the Ti concentration increased; precipitation thoroughness increased when the temperature was lowered to −10°. In a concentration of 15 g/l the Nb did not precipitate when Ti was absent. When Ti was present, a marked coprecipitation of Nb was observed. The degree of concentration of Nb did not affect the completeness of precipitation of Ti. When the Nb-Ti ratio was increased to 50:1, coprecipitation of Nb decreased; it continued to remain relatively high, however. Separation of Ti from the mixed solutions was best done with an Nb-Ti ratio of from 20:1 to 50:1, a starting Ti concentration of ≤ 0.3 g/l, and a precipitation time of 2 - 2.5 days. When KCl was used as precipitating agent, the precipitation of Ti was less complete; the behavior of the Nb was not affected by it.

V.M.

1. Niobium--Separation 2. Titanium--Separation 3. Chlorides--Formation

Card 2/2

CHIZHIKOV, D.M.

USSR/Physical Chemistry- Thermodynamics, Thermochemistry, Equilibria, Physical-Chemical Analysis, Phase Transitions. B-8

Abs Jour: Referat. Zhurnal Khimiya, No 3, 1958, 7137.

Author : O.V. Al'tshuler, G.N. Zviadadze, D.M. Chizhikov.
Inst :
Title : Study of Equilibrium Liquid-Vapor in Sulphur-Selenium System.

Orig Pub: Zh. neorgan. khimii, 1957, 2, No 7, 1581-1586.

Abstract: The partial pressures of S and Se vapors on their fuses at 250° were determined by the flow method. The positive divergence of the pressure curve of Se vapor and the great values of Se activity in fuses with S indicate the formation of chemical compounds. At a temperature rise, the behavior of S-Se system fuses approaches the behavior of solutions, the components of which do not produce chemical compounds.

Card : 1/1 -15-

Distr: 4E4j

27 27 1

Phase diagram for the system $PbO-Na_2O-H_2O$. B. I. [illegible] [illegible] N. Chuhkov. Zhur. Neorg. Khim. 2,

CHIZHIKOV, D.M.

CHIZHIKOV, D.M.; RABINOVICH, B.N.

Tantalum iodides. Zhur. neorg. khim. 2 no.11:2513-2516 N '57.
(MIRA 11:3)

(Tantalum iodides)

CHIZHIKOV, D.M.; USTINSKIY, B.Z.

Investigating the anodic polarization of sulfides of copper, nickel, and some alloys of these sulfides. Zhur.prikl.khim. 29 no.7:1129-1131 Jl '57. (MIRA 10:10)

(Sulfides) (Polarization (Electricity))

Chizhikov, D. M.

20-3-46/59

AUTHORS: Chizhikov, D. M., Corresponding Member of the Academy, Slobodskoy, Ya. Ya., Tsvetkov, Yu. V.

TITLE: Note on the Catalytic Action of Zinc on the Decomposition of Carbon Oxide (O kataliticheskom deystvii tsinka na razlozheniye okisi ugleroda).

PERIODICAL: Doklady Akademii Nauk, 1957, Vol. 115, Nr 3, pp. 586-587 (USSR).

ABSTRACT: It is well known, that at 900°C the decomposition of CO becomes thermodynamically possible. Without an catalysator, however, it does not take place, practically, because of the tight combinations of the carbon- and oxygen atoms in the CO molecule. A number of papers proved, that metal oxydes do not catalyse this reaction, but some metals (Fe, Ni, Co, Cr) act as catalysators, in particular, if they are produced in active form by reduction. References are contradicting with respect to zinc having any effect. This question of the influence of zinc has a great practical importance. There are known, for example, destructions in the upper parts of furnaces, which occured on the smelting of ores with a little zinc content. This formation of zinc oxide in the pores of the furnace coating can also take place in the pyrometallurgy of zinc. In this case the oxidation of zinc leads to a reduction in the production rate of liquid zinc

Card 1/2

Note on the Catalytic Action of Zinc on the Decomposition of Carbon Oxide.

20-3-46/59

metal. The authors have investigated, separately from each other, the kinetics of the reduction on zinc oxide by carbon monooxide and the condensation of zinc vapour in pure carbon monoxide. They observed the formation of soot-like carbon as a decomposition product of CO. This took place at 600-700°C at the samples subjected to reduction, as well as at the walls of the reaction container at the points of lead oxide. This gives reason to the supposition, that the catalytic influence of zinc possesses a maximum, which is dependent on an optimum concentration of zinc. Control experiments without zinc produced neither CO_2 nor carbon black. The above data confirm the catalytic effects of zinc on the decomposition reaction of carbon monoxide in the temperature range from 50°C to 800°C.
There are 12 Slavic references.

ASSOCIATION: Institute for Metallurgy AN USSR imeni A. A. Baykov.(Institut metallurgii im. A.A.Baykova Akademii nauk SSSR)

SUBMITTED: February 26, 1957.

AVAILABLE: Library of Congress.

Card 2/2

AL'TSHULER, O. V., ZVIADADZE, G. N. and CHIZHIKOV, D. M. (Metallurgical Inst im A. A. Baykov AS USSR)

"The Use of Radioactive Selenium for Investigating the Sulfur-selenium System"

Isotopes and Radiation in Chemistry, Collection of papers of 2nd All-Union Sci. Tech. Conf. on Use of Radioactive and Stable Isotopes and Radiation in National Economy and Science, Moscow, Izd-vo AN SSSR, 1958, 380pp.

This volume published the reports of the Chemistry Section of the 2nd AU Sci Tech Conf on Use of Radioactive and Stable Isotopes and Radiation in Science and the National Economy, sponsored by Acad Sci USSR and Main Admin for Utilization of Atomic Energy under Council of Ministers USSR Moscow 4-12 Apr 1957.

3(5) PHASE I BOOK EXPLOITATION SOV/2154

Akademiya nauk SSSR. Vostochno-Sibirskiy filial

Syr'yevyye resursy legkikh metallov Vostochnoy Sibiri, tom. 2 (Light Metal Resources of Eastern Siberia, Vol 2) Moscow, 1958. 298 p. (Series: Its: Trudy, vyp. 13) 1,800 copies printed.

Editorial Board: [illegible] Alekseyev, Ye. P. [illegible], V.S. [illegible], A.F. Li, Doctor of Geological and Mineral Sciences, and Ye. I. Khazanov (Resp. Ed.) Candidate of Technical Sciences; Ed. of Publishing House: V.K. [illegible]; Tech. Ed.: P.S. [illegible].

PURPOSE: This issue of the Eastern Siberian Branch Transactions is of interest to structural, exploration and mining geologists, mineralogists, and metallurgists in the light metal industries.

COVERAGE: This collection of articles is a compilation of the reports presented at the third coordinational conference on "The Creation of a Light Metals Industry in Eastern Siberia Based on Local Ores" organized by the Laboratory of Electrometallurgy of the Eastern Siberian Branch of the AN SSSR in October, 1956. It met for the purpose of promoting coordination between the activities of the power generation combines and the fast developing light metals industry of Eastern Siberia. The reports indicate that large aluminum and titanium-magnesium combines are being constructed in the Krasnoyarsk Kray and the Irkutsk Oblast. These areas provide the cheapest sources of coal and electrical energy. Individual articles also report on the following subjects: general questions in the development of the light metals industry in Eastern Siberia, sillimanite ores, nepheline syenites, bauxites, magnesium ores, etc. References accompany each article.

[illegible], A.R., B.Ye. Mitrofanov, and V.V. [illegible]. Kyakhtinskiye Deposits of Rutile-bearing Sillimanite Schists 39

[illegible], Yu. B. Results of Geophysical Prospecting by the VEZ (Vertical Electrical Sounding) Method at the Kyakhtinskiye Sillimanite Schist Deposits 47

[illegible], G.V., and Ye. I. Khazanov. Physicochemical Properties, Composition, and Dressing Possibilities of the Sillimanite Ores of the Kyakhtinskiye Deposits 50

Li, A.F. and Ye. M. [illegible]. Mineralogical Composition of the Sillimanite Ores of the Kyakhtinskiye Deposits 60

[illegible], I.V., and N.P. Ivanova. Dressing the Sillimanite Ores of the Kyakhtinskiye Deposits 66

[illegible], V.S. Electrothermal Method of Producing Aluminum and Its Alloys 72

[illegible], N.K. Technical and Economic Prerequisites for the Utilization of [illegible] Syenites in the Production of Aluminum and Its Alloys Based on the Energy To Be Supplied by the Planned State Hydroelectric Stations on the [illegible] 86

PART II. NEPHELINE ORES AND THEIR UTILIZATION

[illegible], P.S. Uzhurskiye Nepheline Ores 93

[illegible], L.A. The Distribution of Nepheline Syenites in the Irkutskaya Oblast' and the Buryatskaya ASSR 101

[illegible], N.N. Dressing the Nepheline-Syenite Rocks of the Uzhurskoye Deposits 107

[illegible], G.F., Z.F. [illegible], and A.M. [illegible]. Semi-industrial Testing of the Dressing Ability of the Uzhurskiye Nepheline Rocks 125

[illegible], Ye. I., A.F. [illegible], A.S. [illegible], N.M. [illegible], and F.S. [illegible]. Sintering Uzhurskiye Nepheline Syenites with Limestone in the Presence of a Reducing Agent 134

[illegible], D.M., I.N. Kitler and N.A. [illegible]. Experimental Studies of Granulation in Nepheline Charges and Their Sintering in the "Boiling Layer" 144

[illegible], A.F. Results of Studies Conducted Between 1952-1956 in Selecting Methods for Processing Uzhurskiye Syenites for the Achinskiy Aluminum [illegible] Plant 160

23

CHIZHIKOV, D.M.

CHIZHIKOV, D.M.

18(4) PHASE I BOOK EXPLOITATION SOV/1896

Akademiya nauk SSSR. Institut metallurgii

Metallurgiya, metallovedeniye, fiziko-khimicheskiye metody issledovaniya (Metallurgy, Study of Metals, and Physicochemical Methods of Investigation) Moscow, Izd-vo AN SSSR, 308 p. (Series: Its: Trudy, vyp. 3) Errata slip inserted. 3,000 copies printed.

Resp. Ed.: I.P. Bardin, Academician; Ed. of Publishing House: A.I. Chernov; Tech. Ed.: I.F. Kuzmin.

PURPOSE: This book is of interest to researchers in metallurgy, as well as to the technical personnel of the metallurgical industry.

COVERAGE: This volume of the Trudy (Transactions) of the Institut metallurgii imeni A.A. Baykova (Metallurgical Institute im. A.A. Baykov) contains 31 studies on metallurgy, individual metals and alloys, and physicochemical methods of investigation. Some of the studies pertain to the reduction of titanomagnetites, the viscosity and other characteristics of blast furnace slag, dislocation in metals, cracking of metals due to corrosion, simultaneous

Card 1/6

solubility of metals at various temperatures, apparatus for measuring electrical resistance and for determining the melting point of alloys and metals, optical spectral analysis, quantitative determinations by the sublimation method, and aging of alloys. Each study is accompanied by references.

TABLE OF CONTENTS:

Metallurgy, Study of Metals (Cont.) SOV/1896

Card 4/6

(14)

CHIZHIKOV, D. M.

18(6) PHASE I BOOK EXPLOITATION SOV/1728

Akademiya nauk SSSR. Institut metallurgii

Sovremennyye problemy metallurgii (Modern Problems in Metallurgy) Moscow, Izd-vo AN SSSR, 1958. 640 p. 3,000 copies printed.

Resp. Ed.: A.M. Samarin, Corresponding Member, USSR Academy of Sciences; Eds. of Publishing House: V.S. Rzhevnikov, and A.N. Dernov; Tech. Ed.: T.V. Polyakova.

PURPOSE: This book is intended for scientific and technical personnel in the field of metallurgy.

COVERAGE: This is a collection of articles on certain aspects of Soviet metallurgy. The book is dedicated to Academician Ivan Pavlovich Bardin on the occasion of his 75th birthday. The book is divided into seven parts. The first part consists of two articles presenting a brief account of the biography and professional activity of the Soviet metallurgist. It includes an article by John Chipman, Nicholas Grant, and John Elliott (M.I.T., USA) describing their meeting with Bardin in Moscow and also his visit to the United States. The second part consists of three articles and deals with raw materials and fuels for the Soviet metallurgical industry. The third part represents the major portion of the book. It consists of 25 articles dealing with the various aspects of the metallurgy of pig iron and steel. The fourth part consists of two articles treating the metallurgy of nonferrous metals. The fifth part consists of three articles on the forming of metals. The sixth part consists of eight articles discussing certain aspects of physical metallurgy. The last part deals with general problems in the field of metallurgy. References are given after each article. No personalities are mentioned.

TABLE OF CONTENTS:

Modern Problems in Metallurgy SOV/1728

METALLURGY OF NONFERROUS METALS

Card 9/12

6

CHIZHIKOV, D.M.

CHIZHIKOV, D.M.

LEONIDOV, N.K.

25(5) PHASE I BOOK EXPLOITATION SOV/1497

Akademiya nauk SSSR. Institut nauchnoy i tekhnicheskoy informatsii

Metallurgiya SSSR, 1917-1957, t. 1 (Metallurgy of the USSR, 1917 - 1957, Vol. 1) Moscow, Metallurgizdat, 1958. 745 p. 3,000 copies printed.

Ed. (Title page): I. P. Bardin, Academician; Ed. (Inside book): O. V. Popova; Tech. Ed.: O. G. Rekher.

PURPOSE: The book is intended for scientific workers and engineers in metallurgical plants and in the machine-building industry. It may also be used by students in advanced courses in metallurgical vuzes.

COVERAGE: This collection of articles covers extensively practical and theoretical developments in Soviet metallurgy during the last 40 years. The material deals with the discovery and development of the major ore deposits and the growth of the metal industry in various parts of European and Asiatic USSR. Research institutes, laboratories, their location, and the names of the scientists and engineers involved are listed. Many papers contain so many references and names of various personalities that it was considered beyond the scope of the coverage of each article to list them. The authors claim that the processes, methods and theories described in this book reflect the most recent developments in Soviet metallurgy.

Card 1/21

Metallurgy of the USSR (Cont.) SOV/1497

listed include ferrochromium, ferromanganese, ferrotitanium, ferrovanadium and ferromolybdenum with over 90 percent molybdenum. As a source of titanium the Soviets use perovskite ore to obtain concentrates of 48-51 percent titanium oxide. The sources of vanadium are various titaniferous magnetites. In conclusion it is stated that more experiments and better methods are needed to improve the production of ferroalloys. There are 40 references, 37 Soviet and 3 English.

Pervushin, S.A. Nonferrous Metallurgy Under the Soviet Regime 399
The author gives a historical review of the development of the nonferrous industry since the October Revolution. Production figures and targets of the five year plans are quoted. The locations of new nonferrous metal deposits are listed. There are 11 Soviet references.

Glembotskiy, V.A. Concentration of Nonferrous Ores and Ores of Rare Metals 415
Following a brief historical review the author discusses methods of ore concentration such as flotation, gravity separation, magnetic separation, etc. It is claimed that Soviet scientists have done a great deal of work on the theory of flotation based on the latest achievements in physical

Metallurgy of the USSR (Cont.) SOV/1497

chemistry, geochemistry, organic chemistry, crystallography and solid state physics. Flow sheets with detailed descriptions are given for the flotation of a number of sulphides. Special methods aimed at the recovery of various accessory minerals of economic importance were presented. It is claimed that the problem of cassiterite flotation has been satisfactorily solved by Soviet metallurgists. There are 8 Soviet references.

Chizhikov, D.M. Nonferrous Metallurgy 448
The article contains a historical review of the nonferrous metallurgy industry in USSR followed by a list of the more important of research and metallurgical institutes. A description is given of the methods of treating copper, lead, zinc, aluminum, nickel, and tin. Electrochemical methods and the use of oxygen-enriched air were regarded as the important new developments in the metallurgical industry.

Frents, G.S. Roasting Sulphide Concentrates of Heavy Nonferrous Metals 496
This paper deals with the various aspects of roasting sulphide concentrates. The mechanism of the oxidation of sulphides has been the object of intensive studies. Sintering of sulphides is mentioned. A

Card 3/21

SOV/24-58-5-23/31

AUTHORS: Berezkina, L. G. and Chizhikov, D. M. (Moscow)

TITLE: Kinetics of Reduction of Lead Silicates by Means of Carbon Monoxide (Kinetika vosstanovleniya silikatov svintsa okis'yu ugleroda)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 5, pp 124-127 (USSR)

ABSTRACT: The author studied the kinetics of reduction of lead silicates at various pressures of the carbon monoxide (10 to 400 mm Hg col) in the temperature range from the beginning of an appreciable reduction up to the temperature of fusion of silicates (745°C for 2 $PbO \cdot SiO_2$, 765°C for $PbO \cdot SiO_2$). The experiments were carried out in vacuum equipment with continuous circulation of carbon monoxide and freezing out of the gaseous reaction products CO_2 by means of liquid nitrogen; the progress of the reactions was judged from the loss of weight of the initial specimen during continuous weighing on electro-magnetic scales by means of the compensation method, whereby the recording was effected automatically. The experimental data obtained for temperatures of 700, 650, 600 and 550°C in CO pressures of 400, 200, 50

Card 1/3

SOV/24-58-5-27/31

Kinetics of Reduction of Lead Silicates by Means of Carbon Monoxide

25 and 10 mm Hg are graphed in Figs 1-6. It was found that the reduction of lead silicates takes place at relatively low speeds and incompletely. In the case of a 70 to 75% reduction of the ortho-silicate and a 25 to 35% reduction of the meta-silicate, a considerable drop is observed in the speed of the process, which is caused apparently by the formation of a layer of the solid reaction product SiO_2. An increase in temperature brings about a considerable acceleration of the reduction of the silicates, whereby the dependence of the reaction speed on the temperature complies with the Arrenius equation. The influence of the pressure on the speed of the process is described by an equation of the type of the adsorption isotherm. It is concluded that in reduction heats a considerable part of the lead in the agglomerate, which is combined into silicates, does not become reduced in the solid state and, therefore,

Card 2/3

SOV/24-58-5-23/31

Kinetics of Reduction of Lead Silicates by Means of Carbon Monoxide

reduction of the lead in the molten state assumes considerable importance.
There are 6 figures and 11 references, 9 of which are Soviet, 2 English.

SUBMITTED: February 7, 1958

Card 3/3

SOV/24-58-8-4/37

AUTHORS: Gvelesiani, G. G., Konyshkova, T. Ye, Tsvetkov, Yu.V. and Chizhikov, D. M. (Moscow)

TITLE: On the Theory of Reduction of Oxides of Heavy Non-Ferrous Metals and their Mixtures with Carbon Monoxide (K teorii vosstanovleniya okislov tyazhelykh tsvetnykh metallov i ikh smesey okis'yu ugleroda)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 8, pp 19-25 (USSR)

ABSTRACT: The author deals with certain problems of the kinetics and the mechanism of reduction of oxides of copper, lead and zinc and of mixtures of these oxides with carbon monoxide. The kinetics of reduction of these oxides were investigated under conditions in which these oxides were in the solid state and the reduced metals were in the solid (Cu), the liquid (Pb) and the gaseous (Zn) states. The adsorption-catalytic theory of G. N. Chufarov (Ref.7), which is based on investigations of the kinetics of reduction of oxides of iron and of some other oxides under such conditions that the product of reduction is obtained in the solid phase, is the most satisfactory from the point of view of explaining up-to-date conceptions of the

Card 1/5

SOV/24-58-8-4/37

On the Theory of Reduction of Oxides of Heavy Non-Ferrous Metals and their Mixtures with Carbon Monoxide

mechanism of reduction of oxides with gases. The influence of the aggregate state of a product on the development of the process of reduction with the progress of time has not been considered by Chufarov. Since lead, zinc and copper accompany each other in metallurgical processes, it is of considerable importance to establish the kinetics governing their simultaneous reduction. At present for studying the kinetics of reduction processes the most widely used method is that of determining the reaction speed from the decrease of the pressure of the reducing gas during the reduction process. However, this method has the drawback that it does not give information on the real change of the progress of the process with time since the pressure of the reducing gas changes continuously during the reduction process. The error is particularly pronounced at relatively low pressures when the quantity of the reducing gas is inadequate even for the complete reduction of a specimen of the studied oxide or compound. The experimental technique (see Ref.1) used by the authors of this paper enabled eliminating these drawbacks. The

Card 2/5

kinetics of reduction were studied whilst maintaining a constant pressure of the reducing gas by utilising the automatic recording of the loss in weight of the specimen. In the first part of the paper the authors discuss the results of separate reduction of the oxides of copper, lead and zinc with carbon monoxide, graphed in Figs.1-7. In the second part the reduction of mixtures of oxides of copper, zinc and lead by means of carbon monoxide, graphed in Figs.8 and 9, are discussed. The authors summarise their results thus: the speed of reduction of CuO at temperatures up to 200°C is characterised by the autocatalytic progress of the kinetic curve; reduction of oxides of lead and zinc begins with the maximum speed in the temperature range 450 to 800°C for PbO and 700 to 1000°C for ZnO. The speed of reduction of CuO and PbO increases with increasing CO pressure in the pressure range 25-100 mm Hg col. for CuO and 50-300 mm Hg col. for PbC. The dependence of the reaction speed on the pressure complies with the isotherm adsorptio type equation $v = kp^n$, where $n < 1$; for zinc oxide no such relation has been detected. Depending on the

SOV/24-58-8-4/37

On the Theory of Reduction of Oxides of Heavy Non-Ferrous Metals and their Mixtures with Carbon Monoxide

activity of the oxides being reduced, this relation was observed also in other temperature ranges and pressures. In the system CuO-PbO, CuO-ZnO and PbO-ZnO no chemical compounds were detected; the thermograph analysis of these systems has revealed the presence of a eutectic, with a fusion point of 688°C, in the system CuO-PbO for a molar ratio CuO/PbO = 1:1. In the case of reducing CuO-PbO mixtures, the CuO increases somewhat the speed of reduction of the PbO and this may be due to a local over-heating of its particles; above 700°C the reducing reaction is braked owing to formation of a liquid phase. In the system PbO-ZnO a braking of the reduction of the ZnO is observed in the temperature range 600 to 700°C due to intensive reduction of the PbO and an increase in the CO_2 concentration resulting therefrom which influences the adsorption properties and also the thermodynamics of reduction. Presence of slight quantities of CuO in CuO-ZnO mixtures, up to the molar ratio CuO/ZnO = 0.5:1, has practically no

Card 4/5

influence on the speed of reduction of zinc oxide. There are 9 figures and 8 references, 7 of which are Soviet, 1 German.

SUBMITTED: October 8, 1957

1. Metal oxides--Reduction 2. Gases--Chemical effects 3. Carbon monoxide--Metallurgical effects

CHIZHIKOV, D.M.; KITLER, I.N.; KOVYAKINA, N.A.

Experimental studies on the granulation of nepheline burdens and their sintering in a "fluidized bed." Trudy Vost.-Sib. fil. AN SSSR no.13:144-159 '58. (MIRA 12:12)

1. Institut metallurgii im. A.A. Baykova AN SSSR.
(Nephelite) (Sintering)

AUTHORS: Chizhikov, D. M., Corresponding Member, Academy of Sciences, USSR, Grin'ko, A. M. SOV/20-122-2-31/42

TITLE: Production and Properties of **the Iodide of Niobium** (Polucheniye i svoystva yodidnogo niobiya)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 2, pp. 278 - 279 (USSR)

ABSTRACT: A convenient combination of methods of metal refinery, i.e. of the pyrometallurgical and hydro-electro-chemical, guarantees, in many cases, the high degree of purity of the produced metal. The halide method of refinery of difficultly meltable metals like titanium, zirconium, niobium and tantalum deserves special attention. It is based on the selective effect of the halides. Among them the iodine is specially interesting. The iodide method of the refinery comprises two principle operations: a) the iodide formation of the metal and b) the subsequent dissociation of the iodide. There are only a few publications on niobium-iodides (Refs 1-3). Some are known: NbJ_5, NbJ_3 and Nb_6J_{17}. In the Laboratoriya metallurgii tsvetnykh i

Card 1/2

redkikh metallov (Laboratory for Metallurgy of the Non-Iron- and Rare Metals) the conditions for the operations a) and b) were investigated. If a mixture of metal powder and iodine ($Nb+2.5J_2 = NbJ_5$) is heated in an evacuated container, already at 200° the gold-bronze colored crystals of the niobium-pentaiodide are formed. They smelt without decomposition at 320°. In water and alkaline solutions the salt is quickly hydrolyzed. At 400° the pentaiodide begins to decompose to lower iodides and iodine. Niobium triiodide is the stable final product at 600° as needle-shaped dark-colored crystals. The lower niobium iodide is lightly hydrolyzed in the air and reacts slowly with water and alkaline solutions. Its various other properties and reactions are described. The method described in this place can be used for the production of coatings from niobium. There are 1 figure and 3 references, 0 of which is Soviet.

Card 2/2

Inst. Metallurgy im A.A. Baykov

CHIZHIKOV, D.M.; SCHASTLIVYY, V.P.
(Счастливый)

Zlektromagnitnye svoystva nekotorykh shlakovykh rasplavov.

report submitted for the 5th Physical Chemical Conference on Steel Production.

MOSCOW — 30 JUN 1959

with Berezkina, L. G., "Kinetika vosstanovleniya svintsa i tsinka okisyyu ugleroda."

with Tsvetkov, Yu. V. "O nikotorykh osobennostyakh kinetiki vosstanovleniya okislov s obrazovaniem zhidkogo i paroobraznogo produktov."

CHIZHIKOV, D.M.

Chizhikov, D.M., G.N. Zviadladze, L.A. Ogurtsova, and I.N. Karyazina (Institute of Metallurgy, Academy of Sciences USSR). A Cyclic Method for the Electrolytic Production of Titanium From a Fused Mixture of Chlorides of Sodium and Potassium, p. 113. Titan i yego splavy. vyp. II: Metallurgiya titana (Titanium and Its Alloys. No. 2: Metallurgy of Titanium) Moscow, Izd-vo AN SSSR, 1959. 179 p.

This collection of papers deals with sources of titanium; production of titanium dioxide, metallic titanium, and titanium sheet; slag composition; determination of titanium content in slags; and other related matters. The sources of titanium discussed are the complex sillimanite ores of the Kyakhtinskoye Deposit (Buryatskaya ASSR) and certain aluminum ores of Eastern Siberia. One paper explains the advantages of using ilmenite titanium slags for the production of titanium dioxide by the sulfuric acid method. Production of metallic titanium by thermal reduction processes (hydrogen, magnesium, and carbon reduction) is the subject of several papers, while other papers are concerned with the electrolytic production of titanium. Other subjects dealt with are interaction of titanium with water vapor and with hydrogen and the determination of titanium in slags.

CHIZHIKOV D. M.

[redacted], L. I.

5(4)

PHASE I BOOK EXPLOITATION SOV/2216

Soveshchaniye po elektrokhimii. 4th, Moscow, 1956.

Trudy...; [sbornik] (Transactions of the Fourth Conference on Elect-
rochemistry; 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,
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Ya. M. Kolotyrkin, Doctor of Chemical Sciences; V.V. Losev, P.D.
Lukovtsev, Professor; Z.A. Solov'yeva; V.V. Stender, Professor;
and G.M. Florianovich; Ed. of Publishing House: N.G. Yegorov;
Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engi-
neers, 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 Depart-
ment 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
galvanic processes in metal electrodepositon and industrial elect-
rolysis. Abridged discussions are given at the end of each divi-
sion. 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.

Tsyganov, G.A., A.I. Chernilovskaya, and A.I. Iosilevich
(Institut khimii AN UzSSR-Institute of Chemistry, Academy

Card 21/34

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of Sciences, UzSSR). Separation Coefficient During Sim-
ultaneous Electrodeposition of Metals of the Iron Group 536

Zosimovich, D.P., and N. Ye. Nechayeva. Cathodic Processes
During the Separation of Zinc and Hydrogen at Electrodes
of Other Metals 541

Shluger, M.A. Role of a Side Anion in the Process of Chromium
Electrodeposition 547

Yurkov, V.A. (Lesotekhnicheskiy institut Arkhangel'sk-
Institute for Forest Technology, Arkhangel'sk). Neutra-
lization of Metallic Ions at Macrodistances From the
Cathode 550

Chizhikov, D.M., and L.V. Pliginskaya. Influence of Boric
Acid on the Cathodic Polarization of Nickel in Sulfuric
Acid Solutions 553

Card 22/34

CHIZHIKOV D. M.

[redacted], A. I.

5(4) PHASE I BOOK EXPLOITATION SOV/2216

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 G.M. Florianovich; Ed. of Publishing House: N.G. Yegorov; 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 galvanic processes in metal electrodepositon 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.

Gokhshteyn, Ya. P. (Institut geokhimii i analiticheskoy khimii AN SSSR imeni V.I. Vernadskogo - Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy, Academy of Sciences, USSR). Diffusion of Electrolytes and the Polarographic Method 677

Rozenfel'd, I.L., and K.A. Zhigalova (Institute of Physical Chemistry, Academy of Sciences, USSR). Diffusion of Oxygen Through Thin Films of Electrolytes 684

Discussion [O.S. Ksenzhek, Yu. A. Chizmadzhev, Yu. A. Vdovin, O.B. Khachturyan and contributing authors] 689

PART VIII. ELECTROCHEMICAL PROCESSES IN NONFERROUS METALLURGY 695

Stender, V.V. (Dnepropetrovsk Institute of Chemical Technology imeni F.E. Dzerzhinskiy; Institute of Chemistry, Academy of Sciences, KazSSR). Electrolysis as a Means of Combining

Card 27/34

Several Metallurgical and Chemical Production Processes (Some New Processes of Hydroelectric Metallurgy) 697

Kozlovskiy, M.T. (Kazakh State University, Academy of Sciences, KazSSR). Some Problems of Amalgam Metallurgy - Cementation of Metals With Amalgams 704

Delimarskiy, Yu. K., B.F. Markov, I.D. Panchenko, Ye. B. Gitman, and A. A. Kolotiy (Institute of General and Inorganic Chemistry, Academy of Sciences, UkrSSR). Electrolytic Purification of Lead From Fused Salts 710

Chizhikov, D.M., and V.M. Kovylina (Institute of Metallurgy, Academy of Sciences, USSR). Investigation of the Potentials and Anodic Polarization of Metallic Sulfides and Their Alloys 715

Levin, P.I., and I.A. Bauman (Deceased)(Vsesoyuznyy nauchno-issledovatel'skiy institut tsvetnykh metallov - All-Union Scientific Research Institute of Nonferrous Metals). Special

Card 28/34

features of the Anode Process During the Purification of a Copper-Nickel Anode in a Sulfate-Chloride Electrolyte 720

Zaretskiy, S.A., I.G. Zharnitskiy (Deceased), and I.A. Bogdanova. Anodic Behavior of Manganese and Its Alloys 723

CHIZHIKOV, D.M.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and V on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

2/2

SOV/180-59-1-9/29

AUTHORS: Gvelesiani, G.G., Konyshkova, T.Ye. and Chizhikov, D.M. (Tbilisi and Moscow)

TITLE: Kinetics and Mechanism of the Reduction of Zinc Ferrites with Carbon Monoxide (Kinetika i mekhanizm vosstanovleniya ferrita tsinka okis'yu ugleroda)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 1, pp 50-54 (USSR)

ABSTRACT: The authors describe their studies of the kinetics of the reaction of zinc ferrite (27.1% Zn and 46.8% Fe) free from uncombined oxides with carbon monoxide at 800-1000°C and 10-450 mm Hg. These conditions secured the complete removal of gaseous reduction products: the percentage reductions of the zinc and iron of the ferrite were found from the total loss in weight of the charge, the amount of deposited carbon and the amount of zinc oxide remaining in the charge. It was found that on increasing the temperature from 800 to 1000°C the rate of reduction of the ferrite increases, the increase being greatest at the lowest (10 mm Hg) pressure. Fig 1 shows percentage reduction as functions of time (min) for 1000, 900 and 800°C at 10 mm Hg (curves 1, 2 and 3 respectively) and at 450 mm Hg (curves 1', 2' and 3' respectively).

Card 1/3

SOV/180-59-1-9/29

Kinetics and Mechanism of the Reduction of Zinc Ferrites with Carbon Monoxide

Fig 2 shows the curves for pressures of 450, 250, 50 and 10 mm Hg at 800°C (curves 1, 2, 3 and 4 respectively) and at 1000°C (curves 1', 2', 3' and 4' respectively). Increase in pressure beyond 250 mm Hg produced little effect on reduction rates except in the early stages (where the effect of pressure was always most pronounced). Results were also obtained for the reduction of zinc in the ferrite (Fig 3) and for zinc and iron in the ferrite (Figs 4,5). Figs 6 and 7 show reduction curves for zinc ferrite, for a mechanical mixture of the oxides in stoichiometric proportions and also for zinc oxide reduction in ferrite in a mechanical mixture and in the free state. The results obtained from the reduction experiments and from X-ray phase analysis of zinc-ferrite reduction products (Table) show that the first stage is the decomposition with reduction of the ferrite into zinc oxide and magnetite; after this the process can continue with the reduction of either component predominating, depending on the gas temperature and pressure. The observed sequence of reduction rates of free zinc oxide

Card 2/3

SOV/180-59-1-9/29

Kinetics and Mechanism of the Reduction of Zinc Ferrites with Carbon Monoxide

and zinc in mechanical mixtures and in ferrites is consistent, the authors consider, with the reduction-hindering effect of the carbon dioxide produced in the reduction of iron oxide.

Card 3/3 There are 7 figures, 1 table and 12 references, 6 of which are Soviet, 3 German, 2 English and 1 French.

SUBMITTED: June 7, 1958.

SOV/180-59-2-19/34

AUTHORS: Berezkina, L.G., and Chizhikov, D.M. (Moscow)

TITLE: Kinetics of the Reduction of Lead from a Melt of its Silicates (Kinetika vosstanovleniya svintsa iz rasplava yego silikatov)

PERIODICAL: Izvestiya akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo,1959,Nr 2, pp 109-111 (USSR)

ABSTRACT: The reduction of solid lead silicates by carbon monoxide is slow and incomplete (Ref 1), therefore the kinetics of lead-silicates melt reduction are important. To avoid difficulties normally associated with the determination of the course of reduction reactions in the $PbO-SiO_2$ system the authors have used a radioactive screening method which they developed together with A.M. Yakobson. The method depends on the weakening of a horizontal beam of gamma radiation passing through the melt as a result of the gradual accumulation of lead at the bottom of the crucible. The source consisted of Co^{60} with a total activity of about 120 millicurie in a lead container. The beam was collimated, passed through the melt via special channels in the vertical furnace, and its intensity was determined with a scintillation counter on

Card 1/3

the other side of the furnace. The furnace and crucible could be moved vertically. The apparatus is shown in Fig 1. Voltage for feeding the type FEU-19M photo-electric multiplier was provided from a type "Orekh" rectifier, the current being measured with a type M91 microammeter. The reading of the recorder was found to be linearly related to the quantity of lead liberated. The degree of reduction vs time relations for $4PbO.SiO_2$ were obtained at 800, 900, 1000 and 1100 °C and for $2PbO.SiO_2$ at 900, 1000 and 1100 °C. The curves obtained are shown in Figs 2 and 3, respectively. Chemical analysis and visual examination of reduced silicates revealed that a concentration gradient existed up the melt, suggesting that diffusion was the rate-controlling factor. This was indirectly confirmed by the applicability to the process of a solution of Fick's diffusion equation for a semi-infinite rod (Ref 2). Nominal values of the diffusion coefficients were calculated: 1.0×10^{-4}, 5.6×10^{-5}, 3.1×10^{-5}, 7.1×10^{-6} cm^2/sec for 1100, 1000, 900 and 800 °C,

SOV/180-59-2-19/34

Kinetics of the Reduction of Lead from a Melt of its Silicates

respectively for $4PbO.SiO_2$ and 1.9×10^{-5}, 7.8×10^{-6} and 3.5×10^{-6} cm^2/sec for 1100, 1000 and 900 oC, respectively, for $2PbO.SiO_2$.

Card 3/3 There are 4 figures, 1 table and 6 references, 5 of which are Soviet and 1 English.

ASSOCIATION: Institut Metallurgii AN SSSR (Institute of Metallurgy AS USSR)

SUBMITTED: November 29, 1958

18.9100
5.2200(C)

67796
SOV/180-59-5-6/37

AUTHORS: Gulyanitskaya, Z.F., Schastlivyy, V.P., and Chizhikov, D.M. (Moscow)

TITLE: Influence of Oxides of Alkaline-Earth Metals on the Magnetic Susceptibility of Ferruginous Silicates

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 5, pp 45-48 (USSR)

ABSTRACT: The authors draw attention to the absence of published data on the magnetic properties of silicate melts, although such data would have a useful bearing on the structure of oxide melts and might find practical application. They describe their work on the system SiO_2-FeO-(Fe_2O_3) and SiO_2-FeO-CaO (MgO, BaO) at 700-1300 °C. A Guouy type installation (Fig 1) was used, with a constant field of 4000 oersted, the change in weight of the 6-8 g specimens in the field being determined with an analytical balance to 0.0001 g. The specimen was in a cylindrical corundum crucible in a graphite resistance furnace between the poles of the electromagnet. Temperature was measured with a platinum/platinum-rhodium thermocouple 5 mm from the crucible bottom. A preliminary study was made of the

Card 1/3

67796

SOV/180-59-5-6/37

Influence of Oxides of Alkaline-Earth Metals on the Magnetic Susceptibility of Ferruginous Silicates

susceptibility of SiO_2-FeO-(Fe_2O_3) relative to temperature (Fig 2) and SiO_2-content (Fig 3). Next the influence of CaO, MgO and BaO (up to 30%) was studied; the results being shown by curves 1, 2, and 3, respectively, in Fig 4 as plots of susceptibility against weight % of added oxide at 800 °C (interrupted lines) and 1200 °C (continuous lines). It was found that the susceptibility of SiO_2-FeO-(Fe_2O_3) and SiO_2-FeO-CaO(MgO, BaO) melts with 5-48% SiO_2, 27-52% FeO and 0-30% CaO, MgO or BaO depends mainly on the iron-oxide content. All the compositions studied were paramagnetic, the value depending on temperature and amount of added oxides. This is confirmed by the fact that magnetic susceptibility falls when FeO or SiO_2 is replaced by CaO, MgO or BaO in melts with a constant FeO or SiO_2 content. Thus, at 1300 °C the susceptibility of melts with a constant SiO_2-content is reduced to 1/2-2/3; the change at the same temperature with constant FeO-content melts is less. The greatest reduction in susceptibility is produced by additions of MgO. In melts with a constant

Card 2/3

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67827

SOV/180-59-6-3/31

AUTHORS: Schastlivyy, V.P., and Chizhikov, D.M. (Moscow)

TITLE: Electrical Conductivity and Magnetic Properties of the Ternary FeO-SiO$_2$-CaO(ZnO, Al$_2$O$_3$) Oxide Melts

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 6, pp 16-20 (USSR)

ABSTRACT: The object of the investigation described in the present paper was to study the temperature and concentration dependence of the electrical conductivity and magnetic susceptibility of molten FeO-SiO$_2$-CaO, FeO-SiO$_2$-ZnO, and FeO-SiO$_2$-Al$_2$O$_3$ systems. The results of the experiments, in which the SiO$_2$:FeO ratio in the melt was maintained constant and equal 0.9, are reproduced in Figs 1 and 2. Curves, plotted in Fig 1, show how the electrical conductivity, σ (ohm^{-1}.cm^{-1}), of the melt at 1450 °C varied with the varying concentration (%) of CaO, ZnO, or Al$_2$O$_3$ (curves 1, 2 and 3 respectively); the variation of the magnetic susceptibility (χ.10^{-6}) of these melts at 1450 °C is illustrated in the same manner in Fig 2. In the next series of experiments, carried out at 1450 °C, the FeO content of the melts was maintained constant; the effect of replacing SiO$_2$ with CaO (curve 1),

Card 1/4

4

67827

SOV/180-59-6-3/31

Electrical Conductivity and Magnetic Properties of the Ternary $FeO-SiO_2-CaO(ZnO,Al_2O_3)$ Oxide Melts

ZnO (curve 2), or Al_2O_3 (curve 3), on σ and χ is illustrated in Figs 3 and 4, respectively. The effect of replacing FeO with CaO, ZnO, or Al_2O_3 on σ and χ of melts, in which the SiO_2 content was maintained constant, is illustrated in the same manner in Figs 5 and 6, respectively. Several conclusions were reached. 1) The temperature dependence of the electrical conductivity of the investigated system is represented by an exponential function $\chi = A_{\chi} e\ E_{\chi}/KT$; the activation energy of the electrical conduction does not exceed 18 cal. 2) The magnetic susceptibility of the investigated systems in the 1100-1450 °C temperature range is independent of the temperature; a characteristic feature of these systems is that the transition of these substances from the solid to liquid state is not reflected by discontinuity on the magnetic susceptibility polytherms of these systems. 3) The specific conductivity isotherms of melts with the SiO_2:FeO ratio equal 0.9 indicate that the conductivity of these systems is determined by the concentration of the Fe^{++}, Ca^{++}, and 4

Card 2/4

67827
SOV/180-59-6-3/31

Electrical Conductivity and Magnetic Properties of the Ternary $FeO-SiO_2-CaO(ZnO,Al_2O_3)$ Oxide Melts

Zn^{++} cations. The magnetic susceptibility isotherms of the melts with the $SiO_2:FeO$ ratio equal 0.9 show that this property depends on the constitution of the melt; in systems of this type there appears to be no direct relationship between the electrical conductivity of the mass magnetic susceptibility. 4) In the case of alloys with the constant SiO_2 content, replacing of FeO by CaO, ZnO, or Al_2O_3, invariably results in a decrease in the electrical conductivity; while both electrical conductivity and magnetic susceptibility depend on the Fe ions concentration, their absolute values are determined by the different properties of the Fe^{++} and Fe^{+++} ions. 5) In the case of melts with the constant FeO content, replacing of SiO_2 by CaO, ZnO, or Al_2O_3 brings about a considerable increase in the electrical conductivity; the magnetic susceptibility is increased by the introduction of ZnO or Al_2O_3, but decreases slightly if SiO_2 is replaced with CaO. 6) The series of melts, in which both electrical conductivity and magnetic susceptibility decreased with decreasing FeO

Card 3/4

4

67827
SOV/180-59-6-3/31

Electrical Conductivity and Magnetic Properties of the Ternary $FeO-SiO_2-CaO(ZnO,Al_2O_3)$ Oxide Melts

content, provided the only example of a direct relationship between the concentration dependencies of these two properties.

There are 6 figures and 3 Soviet references.

4

SUBMITTED: July 3, 1959

Card 4/4

S/137/61/000/011/005/123
A060/A101

AUTHORS: Bershak, V. I., Chizhikov, D. M.

TITLE: Investigation of the specific electric conductivity of slags of the system FeO - CaO - SiO_2 - Al_2O_3

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 11, 1961, 10, abstract 11A68 ("Sb. tr. Gos. n.-i. tsvetn. met.", 1959, no. 15, 17-23)

TEXT: A precision apparatus was constructed for the study of the electric conductivity of slags. Methodological principles are elaborated for the measurement of electric conductivity of slags under conditions which require their thermostatic regulation. The specific conductivity of slags of the FeO - CaO - SiO_2 - Al_2O_3 system is studied as applied to the electric smelting of multimetallic products. Additions of alumina lower the specific conductivity of slags of the type RO · SiO_2 (disilicates). The effect of alumina on the specific conductivity of the slags investigated depends on the ratio of CaO and FeO contained in them: the greater the amount of FeO in the slag the stronger is the effect of alumina. At high amounts (> 6%) the alumina behave analogously to silicon, increasing the smelting temperature of the slags and their viscosity,

Card 1/2

S/137/61/000/011/005/123
A060/A101

Investigation of the specific electric ...

and lowering the specific conductivity. The hypothesis established earlier that the replacement of FeO with CaO reduces the specific conductivity of the slags is supported.

T. Kolesnikova

[Abstracter's note: Complete translation]

Card 2/2

SOV/78-4-5-6/46

5(2)

AUTHORS: Chizhikov, D. M., Grin'ko, A. M.

TITLE: The Production and the Properties of Niobium Iodides (Polucheniye i svoystva yodidov niobiya)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 5, pp 979-981 (USSR)

ABSTRACT: The production of niobium iodides was carried out according to three different methods: 1) By the passage of vaporous iodide over heated metallic niobium. 2) Heating the metallic niobium in an iodate atmosphere in a closed vessel. 3) By the interaction between niobium pentoxide and aluminum triiodide. By the passage of the iodine vapors over heated niobium metal iodides of the following composition were obtained: NbJ_5, NbJ_4 and $NbJ_{3,2}$. Serial tests were carried out at temperatures of the metal of from 600 to 1300° and at a temperature of the iodine of 200°C. The apparatus arrangement for the synthesis of iodide is shown by figure 1. The experiments showed that a noticeable quantity of iodide is produced only at 600°. The iodide produced at 900° is partly decomposed with the formation of metallic niobium, which is

Card 1/3

SOV/78-4-5-6/46

The Production and the Properties of Niobium Iodides

precipitated on the glass wall. At 600-630° iodide is sublimated, and at 700° it becomes disproportionated, accompanied by the formation of metallic niobium (Fig 3). The X-ray structural analysis shows that in the sublimated products solid solutions of niobium iodides with various compositions occur (as shown by table 1 and figure 2). By heating a pulverulent niobium metal with iodine in an evacuated sealed quartz vessel a niobium iodide is formed with a stoichiometric ratio of the reacting elements according to the reaction $Nb+1.5J_2 = NbJ_3$, in the temperature interval of 580-600°C. This compound sublimates at 600° and condenses in form of acicular crystals. Some chemical properties of niobium triiodide were investigated. In water or in solutions of sodium hydroxide niobium triiodide hydrolyzes slowly. The solution first turns dark blue and then green. The product of the hydrolysis changes its color gradually from green to brownish and eventually to dark yellow. Niobium triiodide is green when dissolved in a hydrochloric acid solution. During dilution and heating of this solution the greenish niobium (III)-hydroxide is precipitated. Niobium (III)-hydroxide does not form a complex with tartaric acid.

Card 2/3

SOV/78-4-5-6/46

The Production and the Properties of Niobium Iodides

In the interaction between niobium pentoxide and aluminum triiodide NbJ_3 is formed. There are 3 figures, 1 table, and 6 references, 1 of which is Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute for Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: February 8, 1958

Card 3/3

SOV/78-4-5-7/46

5(2)

AUTHORS: Chizhikov, D. M., Grin'ko, A. M.

TITLE: The Refining of Niobium From Iodide (Yodidnoye rafinirovaniye niobiya)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 5, pp 982-984 (USSR)

ABSTRACT: The thermal dissociation of niobium iodide in metal and iodine as well as some properties of the thus produced metal are investigated. An apparatus arrangement for the production of niobium by means of this method was described and is shown in form of a schematical drawing (Fig 1). The dissociation process of niobium iodide was investigated at temperatures of the vessel between 400 and 600° and a furnace temperature of 1300-1600°. At temperatures of less than 400° the dissociation process is slowed down considerably. If the temperature of the vessel is higher than 600° sublimation of the niobium iodide occurs. The structure, microstructure, and the microhardness of the niobium thus produced was investigated in dependence on the dissociation conditions, and it was found that structure depends on the working conditions leading to

Card 1/2

dissociation (Figs 2, 3, 4). The microhardness of the niobium metal varies between 64 and 80 kg/mm^2. By dissociation of niobium, the purest kind of niobium is obtained which, though containing tantalum, is free from other impurities. By using niobium iodide produced by the interaction of niobium pentoxide and aluminum triiodide niobium after dissociation still contains 4-5% aluminum and traces of tantalum. There are 4 figures and 7 references, 3 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute for Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: February 8, 1958

SOV/78-4-9-23/44

5(2)

AUTHORS: Chizhikov, D. M., Gulyanitskaya, Z. F., Schastlivyy, V. P.

TITLE: The Effect of Oxides of Alkaline-earth Metals on the Specific Electroconductivity of Liquid Melt of the System FeO - SiO_2 - (CaO; MgO; BaO)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 9, pp 2067-2071 (USSR)

ABSTRACT: The investigation of the specific electroconductivity of the system FeO - SiO_2 with admixtures of different slag-forming oxides is of importance for the ionic theory of the slag. This theory is confirmed immediately by the electroconductivity and the possibility of an electrolysis of molten slags. Measurements were made by the voltmeter - ammeter method (direct current method). At the outset the system FeO - SiO_2 - (Fe_2O_3) was examined (Table 1). The SiO_2 content was changed to various quantities within the range of 0 and 48 % by weight. As figure 1 shows, the curves flatten out as the SiO_2 content is increased. Up to 28 % by weight of SiO_2 the results are in agreement with

Card 1/2

those obtained by O. A. Yesin and N. V. Zaimskikh (Ref 2). The deviation from the values obtained in reference 2 in the case of higher SiO_2 contents may be explained by the separation of tridymite not considered by the other research workers. Tridymite ascends, melts again, and forms a layer enriched with SiO_2. Figure 2 shows that additions of CaO, MgO, or BaO increase the conductivity of the system FeO - SiO_2 - (Fe_2O_3) at a constant ratio of SiO_2/FeO = 0.9 . The same phenomenon is to be observed when SiO_2 is substituted for by the oxide of an alkaline-earth metal. When FeO is replaced by CaO or MgO a slight increase, and then a drop of the specific conductivity will occur. Increasing additions of BaO result in a continuous decrease in the specific conductivity. There are 2 figures, 1 table, and 16 references, 7 of which are Soviet.

SUBMITTED: April 7, 1958

Card 2/2

SOV/32-25-9-16/53

18(7)

AUTHORS: Berezkina, L. G., Chizhikov, D. M., Yakobson, A. M.

TITLE: Application of Gamma Radiation in the Investigation of the Kinetics of the Reduction of Smeltings

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 9, pp 1074-1076 (USSR)

ABSTRACT: A method for the continuous control of the metal reduction from meltings was developed. It is based on a weakening of the intensity of the gamma radiation travelling through the smeltings due to one ray of the gamma rays being weakened by a layer of the separating metal. The method was used to investigate the reduction kinetics of lead from smeltings of lead silicates (I) with the following composition: $4PbO \cdot SiO_2$ and $2PbO \cdot SiO_2$. On the separation of Pb from (I) a change in the density of the medium by approximately 30% results, the intensity of the above mentioned penetrating ray being changed by 40 - 50%. Measurements were carried out on a unit (Fig 1) using Co^{60} of approximately 120 Millicurie, a photoelectron multiplier FEU-19M, a stabilized "Orekh" type rectifier and a micro-ammeter M-91. The apparatus was calibrated by the insertion of weighed pieces of lead into the smelting. The sensitiveness of the apparatus with respect to

Card 1/2

Application of Gamma Radiation in the Investigation of SOV/32-25-9-16/53
the Kinetics of the Reduction of Smeltings

a displacement of the silicate - lead limit in the smelting amounted to ±0.2 mm with the depth of the lead layer changing from 5 to 6 mm. Diagrams are given on the influence of time and temperature on the reduction degree of lead from the smelting $4PbO \cdot SiO_2$ (Fig 3). By evaluating the kinetic data obtained the diffusion coefficients in the smelting were established. Some limits are given which must be taken into consideration when using the method described. There are 3 figures, 1 table, and 1 Soviet reference.

ASSOCIATION: Institut metallurgii Akademii nauk SSSR im. A. A. Baykova (Institute of Metallurgy, Academy of Sciences, USSR, imeni A. A. Baykov)

Card 2/2

5(4)

AUTHORS: Chizhikov, D. M., Corresponding Member, SOV/20-124-5-39/62
AS USSR, Berezkina, L. G.

TITLE: The Influence of Additions of Compounds of Alkali Metals Upon the Kinetics of the Reduction of Zinc Silicate by Carbon Monoxide (Vliyaniye dobavok soyedineniy shchelochnykh metallov na kinetiku vosstanovleniya silikata tsinka okis'yu ugleroda)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 5, pp 1099-1101 (USSR)

ABSTRACT: The present paper deals with the kinetics of the reduction of zinc silicate $2ZnO.SiO_2$ by carbon monoxide and with the influence exercised by additions of potassium carbonate, sodium carbonate, and lithium carbonate as well as by sodium chloride and calcium chloride upon this process. The zinc silicate is produced by the sintering of purified quartz powder with zinc oxide at temperatures of 1,380-1,400°. The additions are introduced by impregnation from aqueous solutions in quantities of 7.5 mol% with respect to the zinc silicate. This corresponds to a content of 2-5 % by weight of additions to the mixture. Circulation was effected in a vacuum device with continuous

Card 1/4

The Influence of Additions of Compounds of Alkali Metals Upon the Kinetics of the Reduction of Zinc Silicate by Carbon Monoxide SOV/20-124-5-39/62

circulation of the carbon monoxide and by freezing-out of the reaction product CO_2 by liquid oxygen. A diagram shows the influence exercised by temperature on the kinetics of the reduction of zinc silicate by carbon monoxide. Reduction begins at 1,000° at the noticeable rate of 3 % per hour, and a further increase of temperature accelerates reduction considerably. Within the investigated degrees of reduction the process develops practically with constant velocity and the kinetics of the reaction is described by the linear equation $\alpha = kt$. The apparent activation energy of the process is 31 kcal/mol. The pressure of carbon monoxide exercises no influence upon the degree of reduction of the zinc silicate within the limits of 50-400 torr. A further diagram gives data on the reduction of $2ZnO.SiO_2$ with an addition of potassium carbonate. The following explanation of the mechanism and the causes of the specific effect produced by individual additions may be given: During reduction the additions may undergo several transformations, and at experimental temperatures the carbonates are

Card 2/4

The Influence of Additions of Compounds of Alkali Metals Upon the Kinetics of the Reduction of Zinc Silicate by Carbon Monoxide SOV/20-124-5-39/62

dissociated. The oxides of the alkali metals are rather volatile and may be adsorbed on the surface of the silicate. In the case of adsorption of the oxides on the reacting surface lattice defects may form, and active reaction centers may be produced. By an increase of the activity of the surface also the positive influence exercised by the pressure increase upon the reduction of the silicate in the presence of potassium carbonate is explained. By the electronic interaction of the adsorbed compounds with the ions of the surface layer of the lattice the surface mobility (migration) of ions increases, and therby the crystallochemical transformations occurring in the course of reduction are facilitated. The accelerating effect of the carbonate additions decreases in the order potassium-sodium-lithium. The characteristic features of the additions may be due to the difference in the particular features of interactions between the admixtures and the silicate lattice due to electrons. The results obtained by the present paper indicate a considerable acceleration of indirect reduction by the addition of small quantities of alkali

Card 3/4

The Influence of Additions of Compounds of Alkali Metals Upon the Kinetics of the Reduction of Zinc Silicate by Carbon Monoxide SOV/20-124-5-39/62

metal compounds, especially of potassium and soda. There are 3 figures and 5 Soviet references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

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Card 4/4

5 (1, 2)

AUTHORS: Chizhikov, D. M., Corresponding Member AS USSR, Schastlivyy, V. P. SOV/20-127-2-33/70

Oxide

TITLE: The Behavior of Zinc/in Oxide Melts

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 2, pp 356-358 (USSR)

ABSTRACT: The data given in the publications on the influence exercised by zinc oxide on the properties of slags are very rare. The viscosity of the oxide melts containing zinc oxide could not be measured. The iron melts of this type foam up and are not homogeneous in liquid state. It was the authors' object in the present paper to find the reason of the foaming up and to explain the reason of the escaping of zinc vapors in the drawing off of the slag from the lead melting furnace. For this purpose they melted mixtures of iron-, silicon-, calcium-, and zinc oxides in the induction furnace. The mixture was in a corundum (korundizovyy) crucible, this in a tungsten crucible as heater, enclosed in a protective ampoule of quartz. At first a roasting at 1000° was carried out. Table 1 shows experimental data on individual oxides and melts at a heating up to 1600°. Then the mixture was stored in one case at 1400°. This led to the reduction and volatilization of 25 % ZnO. Table 2 gives the results of the

Card 1/3

Oxide
The Behavior of Zinc/in Oxide Melts SOV/20-127-2-33/70

reduction of the zinc oxide in melts containing silica and calcium oxide. By means of the experiments it was found that melts containing iron- and zinc oxide are not homogeneous in the liquid state. At temperatures of the liquid state a reduction and vaporization of metallic zinc occurs. Since SiO_2 and CaO do not change when heated only low iron oxides can be used as reducers. The melts were not ferromagnetic after cooling down to room temperature. Therefore they do not contain metallic iron or magnetite. According to the analysis they contain, however, oxide iron. The presence of nonmagnetic $\alpha \cdot Fe_2O_3$ in the cooled down melt indicates its secondary origin. Therefore it may be assumed that a redox reaction proceeds in melts containing iron- and zinc oxide: $Zn + FeO \rightarrow Zn\uparrow - Fe_2O_3$. The zinc vapors produced escape. There are 2 tables.

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Card 2/3

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~~5(1,2)~~ 18.8100, 5.2200(C)

SOV/20-129-1-48/64

AUTHORS: Chizhikov, D.M., Corresponding Member AS USSR, Gulyanitskaya, Z.F., Schastlivyy, V.P., Petrova, R.N.

TITLE: Properties of the Melts of the System $CaO-FeO-SiO_2$ Upon Substitution of FeO by Zinc Oxide

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 1, pp 174-176 (USSR)

ABSTRACT: The slag formed in melting lead, copper, and zinc contains zinc oxide. Its effect on the properties of the silicate melts mentioned in the title had not been investigated systematically. Investigation results of the effect of zinc oxide on electric conductivity, magnetic susceptibility, and heat content of the above melts are investigated in the paper under review. First of all, melts of SiO_2-FeO (Fe_2O_3) were used. It was proved that an addition of ZnO at a constant ratio SiO_2/FeO = 0.9 or the substitution of silica by ZnO increase the electric conductivity of the melts. If FeO is replaced by ZnO, conductivity decreases. The magnetic sus-

Card 1/3

66499

Properties of the Melts of the System $CaO-FeO-SiO_2$ Upon Substitution of FeO by Zinc Oxide SOV/20-129-1-48/64

ceptibility of the SiO_2-FeO melts depends on temperature and the content of iron oxides. The specific heat of these melts decreases with ZnO addition. The effect of the zinc oxide additions on the properties of the melt mentioned in the title was investigated at a constant ratio SiO_2/CaO (in weight per cent) upon substitution of iron oxydul by zinc oxide in 3 groups. In these groups the ratio mentioned was 0.8; 1.0 and 1.6, respectively. The sum of FeO and ZnO remained constant in all investigations. Thermographical analysis showed that most combinations melt between 1130 and 1230°. Melts with $SiO_2/CaO = 1.0$ and a ZnO content of more than 7.0% have the highest melting temperature. They are sintered at 1300° but not melted completely. Table 1 shows the measurements of the 3 properties mentioned made on twice melted slags and on the melts $CaO-FeO-SiO_2-ZnO$ where FeO was substituted by ZnO. The data are for 1200, 1300, and 1400°. Hence it appears that the specific conductivity is reduced upon substitution of ferrous oxyde by zinc oxide.

Card 2/3

66499

Properties of the Melts of the System CaO-FeO-SiO_2 SOV/20-129-1-48/64
Upon Substitution of FeO by Zinc Oxide

In all melts it decreases as temperature increases. Magnetic susceptibility depends on the content of iron oxides and varies hardly at all with temperature. The investigated melts are paramagnetic. The Curie point lies at 700°. Figure 1 shows that at a ratio of $SiO_2/CaO = 1$ and at 1300° the melts CaO-FeO-SiO_2-ZnO have the highest average values of electric conductivity and magnetic susceptibility but the lowest values of specific heat. Figure 2 shows the isothermal lines of these three properties measured for the conditions last mentioned. At a content of 10% ZnO the curves show breaks which seem to correspond to the formation of a new phase. There are 2 figures and 1 table.

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4

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Card 3/3

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SOV/20-129-6-43/69

AUTHORS: Chizhikov, D. M., Corresponding Member, AS USSR, Schastlivyy, V. P., Blokhina, L. I.

TITLE: The Electromagnetic Properties 21 and the Phase Diagram of the System FeO - SiO_2 - ZnO

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 6, pp 1353-1355 (USSR)

ABSTRACT: The authors investigated melts with a SiO_2 content of 26-64%, ZnO of 0-52%, and FeO of 4-76% photographically and constructed the phase diagram for this range of the system FeO - SiO_2 - - ZnO (Fig 1). The diagram does not correspond to any real equilibrium, as a reaction between FeO and ZnO occurs, in which Zn evaporates and Fe_2O_3 is separated. The diagram distinguishes between four ranges with phase equilibrium, which consist of fayalite, tridymite, willemite, and magnetite, the optical data of which are given in table 2. In the investigated part of the phase diagram no ternary compounds of the type $xFeO.ySiO_2.zZnO$ are found. For the determination of the growth rate of the individual mineral phases the melts were heated to 1300, 1200, 1000, 800, and 600°C, and quenched to 20°. Table 3 gives the

Card 1/2

68174

SOV/20-129-6-43/69

The Electromagnetic Properties and the Phase Diagram of the System $FeO - SiO_2 - ZnO$

measured grain sizes of the mineral phases. Specific electric conductivity was measured between 1450 and 1000°, and with a constant ratio $SiO_2/FeO = 0.9$, an increase of conductivity with an increase in the concentration of ZnO was found. The change of conductivity has distinct singular points in the case of the occurrence of willemite and the vanishing of tridymite in the melt (Fig 2). All melts investigated were paramagnetic. Their magnetic susceptibility depends on the FeO content. There are 2 figures, 2 tables, and 2 Soviet references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

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Card 2/2