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ACCESSION NR: AP4042207

powder at pressures above 10 atm is a heterogeneous process. In the initial stage, a dispersed system of gaseous decomposition products and solid particles is formed; in a later stage, exothermic reactions of the gaseous products take place on the surface of the glowing solid particles, which accelerate the reactions of the gaseous products, and this stage becomes the controlling factor for the burning velocity of the explosive. Experiments were also carried out with the burning of other explosives (trotyl, hexogen, and a mixture of trotyl with ammonium nitrate) containing 3—6% charcoal. These experiments also confirmed that the presence of charcoal accelerates the burning of explosives, owing to the formation of a dispersed system ("smoke") with glowing solid particles. Orig. art. has: 1 figure.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics, Academy of Sciences SSSR)

SUBMITTED: 19Feb64 / ATD PRESS: 3062 ENCL: 01

SUB CODE: FP, WA NO REF SOV: 006 OTHER: 002

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ENCLOSURE: 01

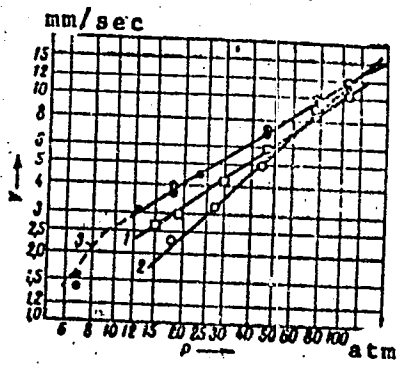

Fig. 1. Dependence of burning velocity on pressure

1 - Smokeless powder; 2 - PETN; 3 - PETN + charcoal.

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

ACCESSION NR: AP4033397 S/0076/64/038/003/0579/0582

AUTHOR: Belyayev, A. F. (Moscow); Kurbangalina, R. Kh. (Moscow)

TITLE: Realization of detonation conditions for black powder

SOURCE: Zhurnal fizicheskoy khimii, v. 38, no. 3, 1964, 579-582

TOPIC TAGS: black powder, detonation, steady state detonation, critical diameter, combustion rate, nonsteady state convective burning, explosive

ABSTRACT: Conditions for the steady-state detonation of black powder have been realized for the first time. Since the critical diameter of black powder is large and its rate of combustion at high pressures is relatively low, it is impossible to cause detonation with a capsule detonator or with a detonating fuse passed through the powder. Detonation of considerable masses of loose black powder requires an intermediate detonator of large weight, e. g., a charge of finely ground low-density (0.6—0.7 gm/cc) trinitrotoluene. The detonation rates of

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ACCESSION N... AP4033387

black powder and ammonium nitrate were similar. In experiments run with black powder of different densities (0.9 and 1.1 gm./cc), when the diameter of the charge was greater than critical, the rate of detonation increased almost linearly with density. The value of about 400 m/sec given earlier (G. Kast, Vzry*vchaty*e veshchestva i sredstva vosplameneniya, 1932) for the rate of detonational conversion of black powder is apparently that for nonsteady-state convective burning.

ASSOCIATION: Akademiya nauk SSSR, Institut khimicheskoy fiziki (Academy of Sciences SSSR, Institute of Chemical Physics)

SUBMITTED: 29Dec62 ATD PRESS: 3057 ENCL: 00

SUB CODE: WA NO REF SOV: 008 OTHER: 000

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BELYAYEV, A.F. (Moskva); LUKASHENYA, G.V. (Moskva)

Effective deflagration temperature of certain explosives.
PMTF no. 6:114-120 N-D '63. (MIRA 17:7)

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BELOGUROV, Yu.A.; BELYAYEV, A.F.; VISHNEVSKIY, P.; ZAKHAROV, V.N.; KAGANER, M.; MARGOLIN, L.M.; PASHKOV, Yu.S.; POLYAKOVA, Ye.A. SMIRNOVA, S.I.

In the Main Administration of the Hydrometeorological Service. Meteor. i gidrol. no.6:62 Je '64 (MIRA 17:8)

In the institutions of the Hydrometeorological Service. Ibid.: 63.

Meetings, conferences, seminars. Ibid.:63-64

Abroad. Ibid.:64.

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[illegible], A.I., [illegible], S.A.

Mechanism of the burning of smokeless powder at elevated pressures. Dokl. AN SSSR 157 no. [illegible] 380 [illegible] 164.
(MIRA [illegible])

1. Institut khimicheskoy [illegible] AN SSSR, [illegible] akademikom Ya.P.[illegible] [illegible].

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L 7678-66 EPA/EWT(m)/EWP(f)/FCC/EWP(j)/FCS(f)/EWP(m)/EWA(c)/ETC(m) RPL
WW/JWD/RM
ACC NR: AP5026023 SOURCE CODE: UR/0405/65/000/001/0025/0030

AUTHOR: Belyayev, A. F. 44,55 (Moscow); Kondrashkov, Yu. A. 44,55 (Moscow); Lukashenya, G. V. 44,55 (Moscow); Parfenov, A. K. 44,55 (Moscow); Tsygankov, S. A. 44,55 (Moscow)

ORG: none

73
71B

TITLE: Flame combustion of model mixtures of oxidizer with fuel

SOURCE: Nauchno-tekhnicheskiye problemy goreniya i vzryva, no. 1, 1965, 25-30

TOPIC TAGS: propellant solid propellant 11 combustion, composite propellant, burning velocity 23,44,55

ABSTRACT: The relationship between the burning velocity (u) and pressure (p) of composite propellants has been studied at subatomic pressure. Ammonium perchlorate-trotyl, 11 potassium perchlorate-trotyl, 11 ammonium perchlorace-asphalt, ammonium perchlorate-paraformaldehyde, and ammonium perchlorate-polystyrene were ground to 20 to 40 μ and intensively mixed and compacted to 98% of the maximum density. Although the propellants had different fuels, oxidizers, and polymer binders, the u-vs-p relationships were linear. Therefore, it appears that systems which contain sufficiently fine components and a fuel which can be

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gasified by decomposition, pyrolysis, or evaporation, give linear u-vs-p relationships at subatmospheric pressure. The experimental results together with an evaluation of burning velocities at higher pressures, obtained previously, indicate that the following four regions exist: 1) a low-pressure region characterized by a plane flame front up to about 2 atm (D = 1); 2) the region of transition from a plane to a multiflame front with a nonlinear u-vs-p relationship (D < 1) at 2.5—3 to 100—250 atm; 3) a high-pressure region characterized by a multiflame front but with a linear u-vs-p relationship from 100—200 to 1000—1500 atm; and 4 a region above 1500 atm (D < 0.3—0.4). Multiflame fronts consist of flames which propagate along the fuel-oxidizer boundaries into the propellant. Orig. art. has: 6 figures. [M PV]

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L 37703-65

ACCESSION NR: AP5006706 S/0076/65/039/002/0534/0536

18
B

AUTHOR: Zel'dovich, Ya. B.; Semenov, N. N.; Khariton, Yu. B.; Belyayev, A. F.; Glazkova, A. P.; Kondrikov, B. N.; Orlova, Ye. Yu.; Svetlov, B. S.

TITLE: Obituary of Konstantin Konstantinovich Andreyev

SOURCE: Zhurnal fizicheskoy khimii, v. 39, no. 2, 1965, 534-536

TOPIC TAGS: explosive theory, explosive combustion, detonation, critical combustion diameter, nitro derivative

ABSTRACT: Konstantin Konstantinovich Andreyev, Doctor of Engineering Sciences, died on 9 May 1964. Son of a physician, he was born in February 1905. Prior to his graduation in 1929 from the khimicheskiy fakul'tet Moskovskogo vysshego tekhnicheskogo uchilishcha (Chemical Faculty of the Moscow Higher Technical School), he spent approximately one year at the Physical Chemistry Institute of Berlin University under the guidance of the well known German physical chemist Prof. P. Gunther. After several years spent at the MVTU, he joined the Institut khimicheskoy fiziki (Institute of Chemical Physics). In February of 1935 he became a professor at and later (1938) head of the Moskovskiy khimiko-tekhnologicheskiy institut im. D. I. Mendeleyeva (Moscow Chemical Engineering Institute). Dur-

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ACCESSION NR: AP5006706

ing the 35 years of his scientific career, K. K. Andreyev published some 150 papers. He studied extensively the combustion of explosives, and the kinetics and mechanism of their thermal decomposition; the transition of combustion to explosion and detonation; the detonation capability of explosives and powders; their sensitivity to mechanical interactions; the production of useful gaseous products during explosions; the theory of explosion safety; and the like. His main concern centered around the main point - the theory of combustion of explosives. He was the first to study, more than 30 years ago, the combustion of secondary explosives. In the thirties and forties he designed now universally accepted instruments for the study, at constant pressure, of the combustion of explosives. He established differences in the combustion capability of various explosives and proposed, as a criterion, the critical combustion diameter. He formulated qualitatively the concept of ignitability of explosives and soon discovered the parallelism between the ignitability and combustion capability. He was one of the first to study the transition from combustion to explosion experimentally. In the mid-forties he observed the self-agitation during the combustion of liquid explosives experimentally, which had been predicted theoretically L. D. Landau. In contradistinction to numerous researchers abroad, Andreyev also studied the thermal decomposition of mononitrates at that time and investigated nitroglycerin, nitroglycol, nitrocellulose, and the like. He showed that the decomposition of polynitrates is actually a

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multistage process. His contributions to the theory of explosives are of such importance that he may rightly be considered the founder of this important branch of science. In 1960, together with A. F. Belyayev, he published the basic textbook on the theory of explosives. During his pedagogical career, Prof. Andreyev taught hundreds of engineers and sponsored some 25 doctoral candidates. He was honored by receiving several high decorations.

ASSOCIATION: None

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combustion proceeded upward. Combustion time was measured with a piezoelectric pickup. To record accurately combustion completion, a small amount of fast-burning potassium picrate was placed at the upper end of

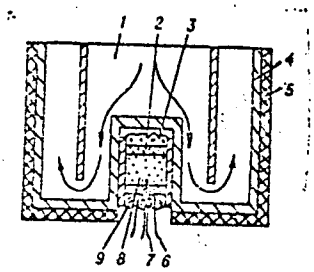

Fig. 1. Charge heating

1 - Hot-air stream; 2 - potassium picrate; 3 - thermal insulation; 4 - body of heater (stainless steel); 5 - thermal insulation (asbestos); 6 - spiral for ignition; 7 - thermocouple; 8 - charge; 9 - igniting composition.

the charge. The data given in tabular and graphic form involve T_0 values from -65 to 200C, combustion temperatures from 1500 to 2900K, and pressures from 1 to 100 atm. It was found that in all cases u is monotonic increasing with T_0. The dependence $u(T_0)$ was conveniently characterized by the temperature coefficient $\beta = d\ln u/dT_0$. β was highly dependent on the fuel/oxidizer ratio (α). The curve $\beta(\alpha)$ had a minimum whose position corresponded to that of the burning velocity peak. For mixture compositions not too far from stoichiometric, β increased with

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oxidizer particle size. The experimental results were in good agreement with the idea that β is determined by the temperature (T_b) in the combustion zone region which determines the burning velocity; if T_b is large, β is small and vice versa. Orig. art. has: 5 figures and 7 tables.

[W. A. 68]
[SM]

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

RUDKOV, G.V.; BELYAYEV, A.G.

Our method for reconditioning the jacket of M753 diesel engine cylinders. Elek. i tepl.tiaga 7 no.11:17 N '63. (MIRA 17:2)

1. Zamestitel' nachal'nika Kustovogo proyektno-tekhnologicheskogo otdela po remontu i ekspluatatsii teplovozov pri zavode im. Il'icha, Zhdanov (for Rudkov). 2. Starshiy inzh. Kustovogo proyektno-tekhnologicheskogo otdela po remontu i ekspluatatsii teplovozov pri zavode im. Il'icha, Zhdanov (for Belyayev).

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BELYAYEV, A.G., inzh.

Reconditioning of cylinder jackets of the M753 diesel engines. Mashinostroenie no.2:102 Mr-Ap '65. (MIRA 18:6)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

Deceased

KOMAROV, N.M., prof.; GROMYKHIN, P.S., kand.veterinarnykh nauk;
BELYAIEV, A.I., veterinarnyy vrach [deceased]

Free maintenance of dairy cows without stalls. Trudy VIEV 26: 236-249 '62. (MIRA 16:2)

1. Laboratoriya zoogigiyeny Vsesoyuznogo instituta eksperimental'noy veterinarii.

(Dairy cattle)

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PROCESSES AND PROPERTIES INDEX

4

Production of aluminum sulfide. A. I. Belyaev, A. I. Lainer and R. I. Khazanov. *Legkie Metal* 4, No. 9, 14(1939).- Bauxite, pyrite, ZnS and coke were fused in an elec. furnace. The slag produced contained up to 66% Al_2S_3. H. W. Rathmann

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4

Electrolysis of fused aluminum sulfide. E. I. Khazanov and A. I. Belyaev. *Legkie Metal.* 4, No. 11, 1-14(1935).—Al_2S_3 was electrolyzed in a fused mixture of 70% NaCl and 30% $NaAlF_6$ at 800°. A current efficiency of 55% was obtained. Addn. of Al_2O_3 did not influence the efficiency. Addn. of FeS reduced the efficiency sharply. H. W. R.

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BELYAYEV, A.I.

7

*Electrolysis of Alumina with Inc[illegible]ustible (Metal) Electrodes. A. I. Belyaev and J. E. Studentsov (*Legkie Metalli* (*Light Metals*), 1936, (3), 15–24). —[In Russian.] The possibilities of alumina electrolysis with copper, nickel, chr mium, and silver anodes were investigated. The use of an equimolecular mixture of potassium and sodium cryolites as electrolyte allows of a minimum working temperature of 936° C. The solubility of aluminium oxide in this bath is 13% at 830° C. In all cases rapid destruction of the anodes by oxidation occurred.—D. N. S.

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Baths with liquid cathodes. A. I. Belyaev. *Legkie Metal.* 8, No. 12, 11-14(1939); *Chem. Zentr.* 1938, I, 2951.—The construction now used for baths with liquid cathodes is discussed. Present construction does not give the expected results for the following reasons: (1) insufficient capacity of the baths; (2) the use of refractory material of inferior quality as lining; (3) supplying current through channels of liquid Al, since the formation of cavities during the solidifying of the Al in the channels raises the resistance.

M. G. Moore

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PROCESSES AND PROPERTIES OF EX

Electrolysis of alumina in fused cryolite with oxide anodes. A. I. Belyaev and Ya. E. Studentsov. *Legkie Metal.* 6, No. 3, 17-24(1937); cf. *C. A.* 30, 7045[5]. Anodes of Fe_2O_3, SnO_2, Co_2O_3, NiO, ZnO, CuO and Cr_2O_3 prepd. by compressing the powdered oxide under 1000 kg. per sq. cm. and sintering at 1300° were used to electrolyze a cryolite soln. of Al_2O_3. Anodes of Fe_2O_3, SnO_2, Co_2O_3 and NiO were most stable. O was evolved at the anodes during electrolysis. H. W. Rathmann

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PROCESSES AND PROPERTIES INDEX

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Baths with liquid cathodes. (Answer to Khvilivitskii and Pavlov). A. I. Belyaev. *Legkie Metal.* 6, No. 4, 10-11(1937); *Chem. Zentr.* 1938, I, 2051, cf. preceding abstracts. The objections of K. and P. to the correctness of the calcns. for baths with liquid cathodes are answered on the grounds that through the increased thermal cond. of the bottoms of baths with liquid cathodes only the excess heat is given off. In baths of high capacity of different construction (not liquid cathodes) this must be provided for by artificial cooling. M. G. Moore

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Cathodic processes in the electrolysis of cryolite-alumina melts. A. I. Belyaev. *Tsvetnye Metal.* 1938, No. 7, 87-93.—B. conducted expts. to det. whether in the electrolysis of cryolite-alumina mixts. the dissocn. of Al_2O_3 and AlF_3 of cryolite forms Al^{+++} ions which are deposited on the cathode, or this is preceded by the deposition of Na, with the deposition of Al following as a secondary reaction of Al_2O_3 and AlF_3 with Na. Decompn. potentials of the following melts were detd.: Na_3AlF_6 + 15% Al_2O_3, K_3AlF_6 + 15% Al_2O_3 and Li_3AlF_6 + 7% Al_2O_3. In all cases the decompn. potentials were found to be equal (2.20 at 950° and 2.01 at 1080°), and thus not dependent on the nature of the cryolites used. From this B. concludes that the cathodic process is essentially the primary neutralization of Al^{+++} ions. The decompn. potential of pure Na, K and Li cryolites at 1080° was 2.07 v. for Na_3AlF_6; 2.13 for K_3AlF_6, and 2.20 for Li_3AlF_6. Conclusion: The Al^{+++} ions whose neutralization dets. the cathodic process are the result of dissocn. of Al_2O_3.

H. N. Damloff

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PROCESSES AND PROPERTIES INDEX

Electrolysis of (fused) alumina with ferrite anodes

A. L. Belyaev. *Legkie Metal* 7, No. 1, 7-20(1938); cf. C. A. 31, 8384[9]. Anodes of $ZnO.Fe_2O_3$, $NiO.Fe_2O_3$, $2CaO.Fe_2O_3$, $MgO.Fe_2O_3$, $Al_2O_3.Fe_2O_3$, $SnO_2.Fe_2O_3$, $Cr_2O_3.Fe_2O_3$ and $Cu_2O_3.Fe_2O_3$ were prepd. by sintering a mixt. of the oxides at 1200°, compressing under 1000 atm. and sintering again at 1300°. Resistivity at 20-1000° and the soly. in cryolite + 5% Al_2O_3 at 1000° were detd. Both values for ferrites were considerably less than those for the oxides of which they were composed. In electrolysis of a cryolite soln. of Al_2O_3, anodes of $SnO_2.Fe_2O_3$, $NiO.Fe_2O_3$ and $ZnO.Fe_2O_3$ were most stable. The Al produced with these anodes contained, resp., Sn 0.80, Fe 1.27; Ni 0.45, Fe 1.20; ZnO and Fe 2.01%. O_2 and a small amt. of F_2 were liberated at the anode. Anode effect did not occur. H. W. Rathmann

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

CA

Electrolytic refining of aluminum. A. I. Belyaev. *Tsvetnye Metal.* 1938, No. 11, 84-93. Fluorides as electrolytes require very high temp. (1000°); chlorides can be electrolyzed at lower temps. but are not as stable as fluorides. B. sought an electrolyte composed of fluorides, with a lower m. p. Several electrolytes were prepd. in which BaF_2 varied from 30 to 40% and NaF + AlF_3 from 60 to 70%, with mol. ratio of NaF AlF_3 varying from 1.25 to 1.5. Expts. showed that BaF_2 raises the solidification temp. and that the decrease in the ratio NaF AlF_3 lowers it. An electrolyte contg. BaF_2 40, NaF 36 and AlF_3 24 mol. % was chosen for further expts. It freezes at 842°; Al_2O_3 dissolves in it to the extent of 1.7% and lowers its solidification temp. to 830°. Lab. expts. were made, using graphite cells, to study the effect of variables, such as temp., c. d., time, admixts., on an anodic melt contg. 35.32% Cu, 0.12% Fe, 0.30% Si and 64.24% Al. Tests made at temp. from 830 to 900° showed that the best recovery of Al is obtained at 850°. The difference in quantity of Al at the anode and that recovered at the cathode is 1.8%, i. e., nearly equal to the value of the soly. of Al in the electrolyte. The temp. of electrolysis does not affect the purity of the Al on the cathode. Tests using c. d. of 0.75 to 6.0 amp./sq. cm. showed that the recovery increases with c. d., but c. d. has no effect on the purity of cathodic Al. To det. the effect of time, tests were made on an anodic sample contg. 35.48% Cu, 4.06 Si, 0.64 Fe and 60 Al. For runs lasting 90 to 360 min. the cathodic recovery was the same, while dissolution of Al on the cathode decreases with time. These tests also showed that increases of Fe to 1.5%, Cu to 65%, and Si to 7% do not result in increase of these elements in the cathodic Al. A series of anodes were made to study the effect of admixts. of various elements on the purity of cathodic Al. These melts were electrolyzed at 850° with c. d. of 5 amp. using the first electrolyte. It was found that metals less noble than Al go into soln. but are not deposited on the cathode, except mechanically, and therefore accumulate in the electrolyte. Polarization voltages were found to vary between 836 to 1173 mv. at various conditions. They increase with c. d. and concn. of Cu in the anodic melt, and decrease with increasing temp.

B. N. Damloff

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Bokarev, A. I. *The Metallurgy of the Light Metals.* [In Russian.] Pp. 496. 1940. Moscow and Leningrad: Metallurgizdat. (15 Rbl.)

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Electrolytic refining of aluminum by the two-layer (Hoopes) method. A. I. Belyaev and I. R. Nikulin. *Tsvetnaya Met.* 16, No. 20, 29-32(1941); *Chem. Zentr.* 1944, II, 1221; cf. *C.A.* 33, 4880[8].—The effect of various elements on the electrolytic refining of Al by the Hoopes process was investigated. It was found that the presence of up to 25% Si, 23% Cu, 22% Zn, 10% Mg, and 8% Fe in the anodic alloy did not interfere with the process and caused no contamination of the cathodic Al. The measured polarization voltage for the refining process was higher than 0.5 v.

M. G. Moore

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ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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BELYAEV, Aleksandr Ivanovich, 1902-

The Metallurgy of light metals. Moskva, Gos. nauchn.-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metalurgii, 1944. 543 p. (49-55391)

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Effect of potassium compounds on the disintegration of a carbon floor of an aluminum cell. A. I. Belyaev. *Tsvetnye metal*, 19, No. 3, 34-40(1946).—A study of the system Na_3AlF_6–K_2O at 900-1000°, revealed that K_2O is very sol. in molten cryolite. The K_2O is transformed into KF. Expts. on fusing Na_3AlF_6 with various quantities of K_2O or KF with and without Al_2O_3 in graphite and carbon crucibles showed that the crucibles strongly absorbed the K compds. The extent of absorption increased with the concn. of K compds. The angles of contact made by drops of Na_3AlF_6 + KF, Na_3AlF_6 + K_2O, Na_3AlF_6 + Al_2O_3, and Na_3AlF_6 + NaF on C plates were measured. The angle of contact of Na_3AlF_6 at 1000° for 1 min. was 140°. Addn. of 6% of Al_2O_3 decreased the angle to 63°; and 10% Al_2O_3 decreased it to 39°. Addn. of 5 and 10% NaF decreased the angle to 27 and 20°, resp. The angle of NaF could not be measured after 1 min. at 1000° since the drop was rapidly absorbed by the C. After 15 sec. at 1000° the angle was 37°. Five % KF decreased the angle of Na_3AlF_6 at 1000° after 1 min. to 10° and 10% KF to 9°. KF alone was completely absorbed after 4 sec. The presence of 5% K_2O decreased the angle to 20°, while 15 and 20% of K_2O decreased the angle to 20 and 14°, resp. Twenty-five % of K_2O caused the drop to be absorbed after 1 min. at 1000° and with 50% K_2O the drop was absorbed in 10 sec. Thus K compds. and particularly KF in fused cryolite strongly lower the surface tension at the fusion C interface and promote the adsorption of the electrolyte by the C. The corrosive effect of K_2O and KF on C cathodes was also established. The deleterious effect of K_2O and KF begins at concns. above 5%. Thus it can be calcd. that for safe operation, the alumina used for electrolytic production of Al should contain no more than about 0.16% of K_2O. M. Hosch

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A. I.

"Metallurgy of Light Metals," third edition, Moscow, 1949. 428 pages.

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BELYAYEV, A.I

25124. BELYAYEV, A. I. Vyyavlyenie Rabotosposobnosti U Plemennykh Tabunnykh Loshadey. Konevodstvo. 1949. No. 4, C. 23-29

SO: Letopis' No. 33, 1949

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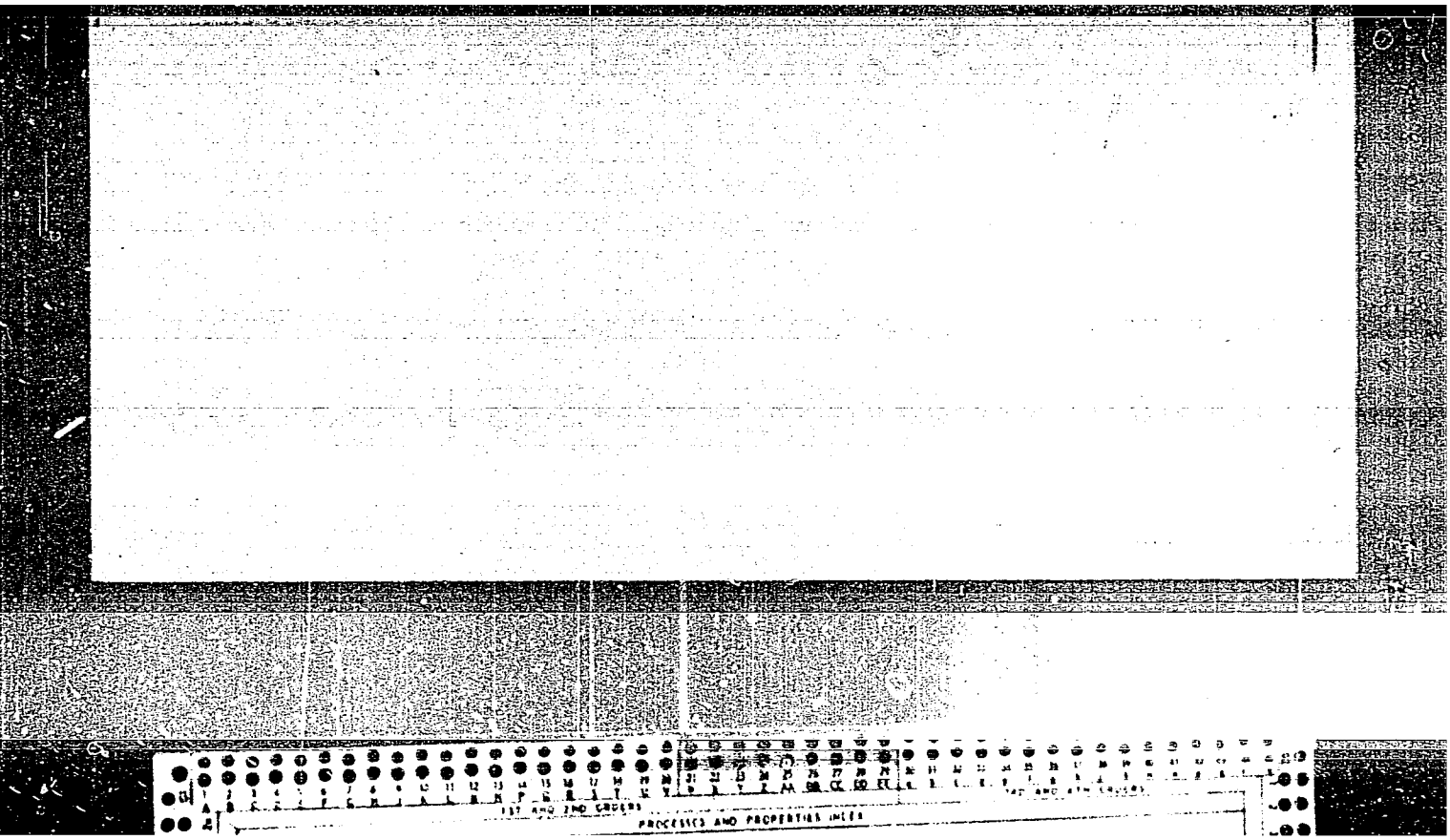

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ALUMINIUM
VOL. II, 1950
NO. I, JAN.

A. I. Bielugen:
Welting and adsorption in aluminium electrolysis III. (From the Russian) 278–279
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BELYAYEV, Aleksandr Ivanovich.

Nikolay Nikolayevich Beketov, Bydayushchiysya Russkiy Fiziko Khimik I Metallurg [Nikolay Nikolayevich Beketov, Outstanding Russian Physical Chemist and Metallurgist] 1827-1911. Moskva, Metallurgizdat, 1953.
130 p. illus., Ports.

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BELYAYEV, A. I.

PHASE I TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 436 - I

BOOK Call No.: TN775.B337

Authors: BELYAYEV, A. I., RAPOPORT, M. B. and FIRSANOVA, L. A.

Full Title: ELECTROMETALLURGY OF ALUMINUM

Transliterated Title: Elektrometallurgiya alyuminiya

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Publishing House: State Scientific and Technical Publishing House of Literature on Ferrous and Nonferrous Metallurgy

Date: 1953 No. pp.: 720 No. of copies: 4,500

Editorial Staff

Reviewers: Garbarchuk, G. I., Winner of Stalin Prize and Sushkov, A. I., Engineer

The authors express their thanks to Prof. Dr. V. A. Pazukhin, Prof. E. I. Zhukovskiy, Eng. A. I. Sushkov, Eng. G. I. Garbarchuk, Eng. B. I. Itsykson and P. K. Kovshikov.

Text Data

Coverage: This is a fundamental study of the modern development of aluminum alloy electrometallurgy. It gives a detailed analysis of the theory and practice of the electrolytic production of cryolite aluminum alloys, the electrolytic refining of aluminum and the production of aluminum-silicon alloys in electric furnaces. Design of

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reduction plants and calculation of aluminum baths and electric furnaces for melting aluminum-silicon alloys are briefly discussed. The theoretical part is based mainly on Soviet sources which, in the authors' opinion, by far excel in scope and scientific value the non-Russian literature on the electrometallurgy of aluminum. The practical conclusions are drawn from the achievements of the aluminum industry in the USSR, according to the authors' note in the preface. In the text, however, no reference is made to any installation in operation now in the Soviet Union.

The authors have collected in a single volume a large amount of information from the very extensive and extremely scattered references on the subject treated. The book is written in an easy, comprehensive language, is provided with numerous illustrations and diagrams, and gives a good picture of the methods used in electrolytic production of aluminum in the Soviet Union at the present time.

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Purpose: The book is intended to provide information on the subject treated for engineers, technicians and scientific workers of the aluminum industry as well as students of advanced courses in the electrometallurgy of aluminum.

Facilities: None

No. of Russian and Slavic References: Numerous Russian references in footnotes.

Available: Library of Congress.

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BELYAYEV, A.I.

PHASE X TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 608 - X

BOOK Call No.: AF644431

Author: BELYAYEV, A. I., Prof. Doc.
Full Title: METALLURGY OF LIGHT METALS. (GENERAL COURSE). 4th ed.
Transliterated Title: Metallurgiya legkikh metallov (Obshchiy kurs) Chetv. izd.

PUBLISHING DATA
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Publishing House: State Publishing House of Scientific and Technical Literature on Ferrous and Non-Ferrous Metallurgy
Date: 1954 No. pp.: 403 No. of copies: 9,500
Editorial Staff
Appraisers: Prof. Ye. I. Zhukovskiy; Staff of the Chair of Metallurgy of Light and Rare Metals of the Leningrad Mining Institute (Prof. Doc. N. S. Greyver, Prof. Doc. V. M. Gus'kov and Dotsents I. D. Tsaregorodtsev, P. V. Fileyev and V. K. Gusakovskiy).

PURPOSE AND EVALUATION: This is a textbook on the subject of the metallurgy of light metals approved by the Ministry of Higher Education for students of institutions of higher learning. This very well written and comprehensive book covers in detail the processes of metal production starting with the ores and extending to the obtaining of the pure metal. When compared with various American

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books on the same subject, it is found to include fewer metals and to present only the metallurgical side of their treatment. However, in this limited field the subject is covered much more extensively than in corresponding books in our literature, and no similar textbook in English could be found. Books which were consulted include: Bray, J. L., Non-Ferrous Production Metallurgy, 1947; Institution of Mining and Metallurgy, The Refining of Non-Ferrous Metals: Symposium, 1950; Roberts, E. R., The Extraction of Non-Ferrous Metals, 1950; Dennis, W. H., Metallurgy of the Non-Ferrous Metals, 1954; Hayward, C. R., An Outline of Metallurgical Practice, 1952; Malcuit, S. V., The Aluminum Industry, 1946, and various other books on metallurgy.

TEXT DATA

Coverage: This is a comprehensive textbook on the metallurgy of light metals, covering in detail aluminum and magnesium, and to a lesser extent, beryllium, calcium, barium and lithium. The book does not cover the field of mining or preparation of the ores. It also does not outline the fabrication of those metals and their products nor the technology of their alloys. Presented are: the properties of each of the above-mentioned light metals, its application, the prin-

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ciples of the theory of its processing, and in detail the technology of its production.

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Metallurgiya legkikh metallov (Obshchiy kurs) AID 608 - X
Chetv. izd.

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Metallurgiya legkikh metallov (Obshchiy kurs) AID 608 - X
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No. of References: Russian 30 (1935-1953).
Facilities: Names of many Soviet scientists and workers are mentioned in the text.

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I.

N.N.Beketov, the outstanding Russian scientist. Trudy po ist. tekh. no.5:58-68 '54. (MLRA 8:1)
(Beketov, Nikolai Nikolaevich, 1826-1911)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A. I.

5521* Influence of Various Factors on the Life Span of Aluminum-Electrolysis Vats. Különféle tényezők befolyása az alumínium-elektrolízis-kemencék élettartamára. (Hungarian.) A. I. Bielajev. *Kohászati Lapok*, v. 9, no. 6, June 1954, p. 274-278.

Effect of quality of carbon-briquette lining, design of vat, quality of electrical connections, method and duration of heating-up of vat, peculiarities of starting vat, operation after starting, and working conditions during operation. Diagram.

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

2

Investigation of current efficiency on electrolysis of cryolite-alumina melts. D. Seker and A. I. Belyaev. *Sbornik Nauch. Trudov Moskov. Inst. Tsvetnykh Metal. i Zolota* 1954, No. 24, 117–30; *Referat. Zhur., Met.* 1956, No. 1112.—The influence of various factors on the loss of Al and current efficiency (c.e.) on electrolysis of cryolite-alumina melts (I) was investigated under lab. conditions. Min. loss of Al and max. c.e. corresponds to cryolite ratio 2.7. Introduction into the electrolyte of 5 wt. % CaF_2 or MgF_2 raises the c.e. by 1–2% or 6–7%, resp., on account of reduction of loss of Al because of increase in surface tension of electrolyte at the interface with molten Al under the influence of Ca^{++} and Mg^{++}. In the presence of 5% CaF_2 or MgF_2 max. c.e. corresponds to a cryolite ratio of 2.5. Up to 10 wt. % CaF_2 or MgF_2 raises c.e. at still higher concn. c.e. rapidly decreases, probably as a result of increasing the sp. gr. and viscosity of [illegible] cryolite ratio with I of 2–3 the magnitude of Al loss goes through a max. in relation to Al_2O_3 concn. in the electrolyte. With I of 3, max. corresponding Al_2O_3 concn. is 7–8 wt. %, at I of 2.7, 4–6%, at I of 2, 2–3%. Min. loss of Al on lowering I shifts to the side of lower concn. of Al_2O_3 in electrolyte. At min. c.e. the concn. of CO_2 in anode gases drops sharply. Oxides of Fe, Si, and particularly [illegible] losses and lower c.e. on account of their [illegible] and partly electrothermic reduction. [illegible] temp. of electrolyte increase [illegible] ance, c.e. increases [illegible] concn. in anode gases increases. At [illegible] electrode distance [illegible] concn. of CO_2 [illegible] varies directly as the concn. of Al_2O_3 [illegible] can serve as a c.e. indicator. To insure max. [illegible] ent to work at max. possible concn. of Al_2O_3 in the electrolyte of a given compn.; this requires continuous feeding of baths with Al_2O_3.

V. N. Bednarski

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[illegible] those are less subjected to absorption by the sides and bottom linings of the electrolyte tank than is ordinary chloride-fluoride electrolyte.

Alexis N. Pestroff

MT

AGEYEV, P.Ya.; ALABYSHEV, A.F.; BAYMAKOV, Yu.V.; BELYAYEV, A.I.; BATASHEV, K.P.; BUGAREV, L.A.; VASIL'YEV, Z.V.; GUPALO, I.P.; GUS'KOV, V.M.; ZHURIN, A.I.; VETYUKOV, M.M.; KOSTYUKOV, A.A.; LOZHKIN, L.N.; OL'KHOV, N.P.; OSIPOVA, T.V.; PERTSEV, I.I.; RUMYANTSEV, M.V.; STRELETS, Ye.L.; FIRSANOVA, L.A.; CHUPRAKOV, V.Ya.

Georgii Alekseevich Abramov. TSvet.met. 27 no.2:72-73 Mr-Ap '54. (MIRA 10:10)
(Abramov, Georgii Alekseevich, 1906-1953)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I.; FIRSANOVA, L.A.; ZHEMCHUZHINA, Ye.A.

Unsuppressed anode effects. TSvet.met.27 no.3:35-41 My-Je '54. (MIRA 10:10)

1. Mintsvetmetzoloto.
(Aluminum--Electrometallurgy)

APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5"

"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BAYKONUROV, O.A.; BELYAYEV, A.I.; BOGOMOLOV, V.I.; VANYUKOV, V.A.; GAZARYAN, L.M.; GLEK, T.P.; GORYAYEV, M.I.; KARCHEVSKIY, V.A.; KLUSHIN, D.N., KUNAYEV, D.A.; LEBEDEV, B.N.; LISOVSKIY, D.I.; LOSKUTOV, F.M.; MITROFANOV, S.I.; MOLCHANOV, A.A.; MOSKVITIN, I.N.; OL'KHOV, N.P.; OSIPOVA, T.B.; PLAKSIN, I.N.; PONOMAREV, V.D.; RUMYANTSEV, M.V.; SOKOL'SKIY, D.V.; SOKOLOV, M.A.; SPASSKIY, A.G.; STRIGIN, I.A.; SUSHKOV, K.V.; SHAKHNAZAROV, A.K.; YASYUKEVICH, S.M.

Khosrov Kurginovich Avetisian, obituary. TSvet.met.27 no.3:66-68 My-Je '54. (MIRA 10:10)
(Avetisian, Khosrov Kurginovich, 1900-1954)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

Belyayev, A.I.

BELYAYEV, A.I.; RAPPOPORT, M.B.; FIRSANOVA, L.A.

Causes for the destruction of carbon cathode blocks in starting aluminum cells. TSvet.met. 27 no.6:44-46 N-D '54. (MIRA 10:10)
(Cathodes) (Aluminum--Electrometallurgy)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

HUNGARIA/Chemical Technology. Chemical Products and Their Application. Electrotechnical Manufactures. Electrical Precipitation. Chemical Sources of Current. J-11

Abs Jour: Referat Zh.-Kh., No 8, 1957, 27571

Author : A.I. Beljajev.
Inst :
Title : Electrolyte Composition of Industrial Baths and Possibilities of Its Improvement.

Orig Pub: Kohasz. lapok, 1955, 10, No 12, 516-523.

Abstract: No abstract.

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

Belyayev, A. I.

137-1957-12-23437

Translations from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 87 (USSR)

AUTHOR: Belyayev, A. I.

TITLE: The Role of the Surface Phenomena in the Melting of Secondary Aluminum With Fluxes (Rol' poverkhnostnykh yavleniy pri plavke vtorichnogo alyuminiya s flyusami)

PERIODICAL: Sb. nauch. tr. Mosk. in-ta tsvetn. met. i zolota, 1955, Nr 25, pp 180-194

ABSTRACT: Bibliographic entry

1. Secondary melting 2. Aluminum Fluxes-Applications

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I.

BELYAYEV, A.I.

Eighth scientific and technical conference of students of the Moscow Institute of Nonferrous Metals and Gold. TSvet.met. 28 no.3:75-77 My-Je '55. (MIRA 10:11)

(Nonferrous metals)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

Belyayev, A. I.

BELYAYEV, A.I.

International Congress on Light Metals. TSvet.met. 28 no.6:55-57 N-D '55. (MIRA 10:11)

(Budapest--Nonferrous metals--Congresses)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

1. Mintsvetmetzolato,
(magnesium chloride) (Electrometallurgy)

Formation of sulfates in furnaces during the [illegible] aluminum alloys and their reaction with aluminum [illegible] Tsvetnye Metally [illegible], No. [illegible] in Al reverberatory furnaces had been ascribed to [illegible] reactions between Al and accumulated sublimed salts the analysis of which showed that they contained sulfates of Na and K. Most of the SO_4^{--} (29%) was in the gas ducts; on the walls of the furnace it was not higher than 4%. Within 24 hrs. from 2 to 27 kg. of the sublimed salts accumulated in the ducts. The SO_4^{--} content in the sublimate after 1, 4, and 35 days was 15.07, 30.21, and 52%, resp. The mechanism of formation of SO_4^{--} was studied. In the presence of steam, NaCl and KCl react with SO_2 to form sulfates, the amt. of which increases with the temp. In molten KCl, 1 hr. at 800 and 1000°, 6.5 and 13% K_2SO_4 formed, resp.; the corresponding values for NaCl were 3.3 and 11%. The sublimate contained 50-60% SO_4^{--}. Apparently sulfate formation occurred primarily in the vapor phase. The volatility of the chlorides in 14% SO_2 passing at the rate of 5 l./hr. was increased in the following order: NaCl < KCl < flux contg. 42% NaCl + 51% KCl. At 900-1200° Al did not react appreciably with a sublimate contg. K 20.09, Na 8.96, Ca 0.22, SO_4^{--} 37.30, and Cl^- 20.60% (insol. 1.13%); a yellow film of Al_2S_3 was present at the interface. With a sublimate contg. SO_4^{--} 40.8, K 23.2,

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BELYAYEV, A.I.

3436

SURFACE PHENOMENA IN PYRO- AND ELECTRO-METALLURGICAL PROCESSES. A. I. Belyaev. Uspekhi Khim. 25, 1282-93(1956) Oct. (In Russian)

Studies in pyro- and electrometallurgy of black and nonferrous metals indicate to the importance of the surface reactions (angle of wettability, surface tension, etc.) on the rate of metallurgical processes at elevated temperatures. Improved metallic recovery and reduction in the penetration of melted slags or salts into the furnace lining (electrolysis) can be attained by increasing the content of surface-inactive components (ions) at the border of the slag (salts) and metallic phases, or by reducing the content of surface-active components at the border of these phases. (R.V.J.)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I., professor, doktor.

Industrial aluminum-bath electrolytes and ways of improving them. TSvet.met. 29 no.5:54-60 My '56. (MLRA 9:8)

1. Mintsvetmetzologo.
(Aluminum--Electrometallurgy)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.

Ninth Scientific and Technical conference of students of the Moscow Institute of Nonferrous Metals and of Gold. TSvet.met.29 no.6:72-73 Je '56. (MLRA 9:9)
(Nonferrous metals--Congresses)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, Anatoliy Ivanovich; ZHEMCHUZHINA, Yelena Aleksandrovna; KOSOLAPOVA, E.F., red.; MIKHAYLOVA, V.V., tekhn.red.

[Microscopic analysis of carbon materials and electrodes] Mikroskopicheskii analiz uglerodistykh materialov i elektrodov. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1957. 75 p. (MIRA 11:1)
(Coal) (Electrodes)

APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5"

"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, [redacted]; ZHEMCHUZHINA, Yelena Aleksandrovna; FIRSANOVA, Lidiya Alekseyevna; SKLYARENKO, S.I., professor, doktor, retsenzent; KRESTOVNIKOV, A.N., professor, doktor, retsenzent; CHERNOV, A.N., redaktor; ARKHANGEL'SKAYA, M.S., redaktor izdatel'stva; ATTOPOVICH, M.K., tekhnicheskiy redaktor

[Physical chemistry of soluble salts] Fizicheskaia khimiia rasplavlennykh solei. Moskva, Gos. nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1957. 359 p. (MIRA 10:11)
(Salts, Soluble)

APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5"

"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

LAKERNIK, Mark Moiseyevich; SEVRYUKOV, Nikolay Nikolayevich; BELYAYEV, A.I., prof., dokt.; retsenzent; VELLER, R.L., kand.tekhn.nauk; retsenzent; VANYUKOV, A.V., retsenzent; KROL', L.Ya., retsenzent; SAMSONOV, G.V., retsenzent; LEONIDOV, N.K., inzh., retsenzent; ZHEMCHUZHINA, Ye.A., red.; EL'KINA, L.M., red.izdatel'stva; MIKHAYLOVA, V.V., tekhn.red.

[Metallurgy of nonferrous metals] Metallurgiia tsvetnykh metallov. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1957. 535 p. (MIRA 11:1)
(Nonferrous metals--Metallurgy)

APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5"

"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A. I.

"Univalent Aluminum and its Role in the Electrometallurgy of Aluminum," paper presented at the Metallurgical Congress in Chicago, 6 Nov 1957.

Kalinin Inst. for Nonferrous Metals and Gold.

Eval. and Abst. B - 3,095,520, 6 Nov 1957

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I.

AUTHOR: Belyaev, A.I., Zhemchuzhina, E.A. and Firsanova, L.A.

136-5-11/14

TITLE: Tests of magnesium fluoride as a component of aluminium-bath electrolyte. (Ispytaniya ftoristogo magniya kak komponenta elektrolita alyuminievykh vann.)

PERIODICAL: "Tsvetnye Metally" (Non-ferrous Metals), 1957, No.5, pp. 70 - 74 (U.S.S.R.)

ABSTRACT: In the first section of this work laboratory experiments to elucidate the joint influence of magnesium and calcium fluorides on the properties of aluminium-bath electrolyte are described. The results are shown graphically as a fusion diagram for the quasi-binary system: [2.5 $NaF.AlF_3$ + 5 wt % CaF_2 + 5 wt % MgF_2] - Al_2O_3; as a graph showing the influence of magnesite calcining temperature on the rate of its solution in cryolite melts at 1 000 and 1 020 °C; and as plots of solubility of aluminium in the electrolyte, solubility of alumina, angle of wetting, conductivity, density and melting point against the weight % of CaF_2 and MgF_2. The laboratory results indicate electrolytes should contain 6.5 - 7% MgF_2 for a total content of the fluoride of up to 10 wt %, a suitable cryolite ratio being 2.5 - 2.6. The second part of the paper deals with full scale tests of magnesium-fluoride

Card 1/2

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Tests of magnesium fluoride as a component of aluminium-bath electrolyte. (Cont.) 136-5-11/14

containing electrolytes, started at the Ural Aluminium Works (Uralskom Alyuminievom Zavode) in 1955 and is still continuing. These tests have shown the following favourable effects of MgF_2 additions: increased yield with respect to current and energy; a lower bath working temperature; decreased consumption of anodic material; higher CO_2 content in the anodic gases; lower consumption of aluminium fluoride; better operating conditions and improved working of the bath. Reasons for these effects are discussed and it is noted that favourable effects have also been obtained at aluminium works in Czechoslovakia and at Fushun in China (Chu Tzu Sen. "Influence of magnesium fluoride on the electrolysis of cryolite-alumina melts". Dissertation, Mukden, 1956.). At the latter works, sixteen MgF_2-containing baths are working at the present time. There are 7 references, 5 of which are Slavic.

Card 2/2

ASSOCIATION: Mintsvetmetzoloto.

AVAILABLE:

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A. I.

136-9-10/14

AUTHORS: Garmata, V.A. and Belyayev, A. I.

TITLE: Study of electrode processes in the electrolytic refining of aluminium. (Izucheniye elektrodnykh protsessov pri elektroliticheskom rafinirovanii alyuminiya).

PERIODICAL: Tsvetnyye Metally, 1957, No.9, pp. 58-66 (USSR).

ABSTRACT: The author describes and gives results of investigations of electrode processes during the electrolytic refining of aluminium by the three-layer method. The experiments were based on the study of polarization at the cathode and anode in relation to the current density, temperature, composition of the electrolyte, electrode material, nature of the ionic diffusion and other factors. Laboratory experiments for studying these factors were carried out in a special cell (Fig.1) and further laboratory work on the determination of the electrical-conductivity, density and liquidus temperatures of chloride-fluoride and fluoride electrolytes were made in a palladium cell. Back e.m.f. and polarization of electrodes were studied on industrial cells, with oscillographic recording of current and voltage (Figs.7 and 10). The authors conclude that in the electrolysis of chloride-fluoride (60% $BaCl_2$ + 23% AlF_3 + 17% NaF) and fluoride (48% AlF_3 + 18% NaF + 18% BaF_2 + 16% CaF_2) the primary process on the cathode is the

Card 1/2

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1[illegible]-1-10/14

Study of electrode processes in the electrolytic refining of aluminium.

discharge of aluminium ions and on the anode the electrochemical solution of aluminium. In the mixed electrolyte polarization of -510, -605 and +270 mV correspond to the start of discharge of barium, lithium + sodium and chlorine ions, respectively; in the fluoride electrolyte -575 and +340 mV correspond to start of discharge of sodium and fluorine, respectively. In commercial cells the mean back e.m.f. was 370 mV, a figure which the authors recommend for calculation purposes. As an additive they recommend lithium fluoride (5-6% by weight) or 55% $BaCl_2$ + 35% AlF_3.1.5 NaF + 10% NaCl. The authors state that the use of fluoride electrolyte for primary aluminium refining is unsuitable but can be recommended for secondary metal containing magnesium.

The following assisted in the full-scale work: G. Ye. Vol'fson, Ya. Sh. Katon and L. A. Baldovskiy.

Card 2/2 There are 12 figures, 1 table and 11 references - 7 Russian, 1 German, 1 Italian, 1 French, 1 English.

ASSOCIATION: Mintsvetmetzoloto.

AVAILABLE: Library of Congress.

1. Aluminum-Refining 2. Electrodes-Processes

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV A.I.

AUTHORS: Novikov, N.I. and Belyayev, A.I. 136-11-9/17

TITLE: Investigation of ~~the Physico-chemical~~ Properties of Electrolytes of Industrial Aluminum Electrolyzers (Issledovaniye fiziko-khimicheskikh svoystv elektrolitov promyshlennykh alyuminiyevykh elektrolizerov)

PERIODICAL: Tsvetnyye Metally, 1957, No.11, pp. 46 - 53 (USSR).

ABSTRACT: The authors describe their laboratory experiments on the melting points, density, viscosity and electrical conductivity of electrolytes taken directly from aluminium-production electrolysers chosen so as to cover the whole range of basicity encountered in practice. Palladium apparatus was found to be suitable for dealing with the fluoride and carbon-containing melts. Primary crystallisation temperatures were measured for samples taken in the course of a period between two preparations of the bath, and the temperatures are related to the cryolite ratio (Fig.1). Densities were measured for each sample for a temperature range of 100 - 120 °C, starting from 7 °C above the crystallisation point. Viscosities were determined by a rotating pendulum method for the same electrolytes and the same temperature ranges. The authors discuss their results with reference to electrolyser operation and design and suggest that they enable the unsatisfactory design practice of determining

Card1/2

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

136-11-9/17

Investigation of the Physico-chemical Properties of Electrolytes of Industrial Aluminum Electrolyzers

the fall in potential in the electrolyte layer indirectly to be avoided since they provide quantitative values for the resistivity of commercial electrolytes as well as for the other properties.
There are 7 figures, 4 tables and 12 references, of which 9 are Russian and 3 Swedish.

AVAILABLE: Library of Congress

Card 2/2

1. Electrolytes-Properties-Analysis

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I.

137-58-4-6798

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 69 (USSR)

AUTHORS: Belyayev, A.I., Kolenkova, M.A.

TITLE: An Investigation of the Reaction Between Bauxite Components in Autoclave Leaching (Issledovaniye vzaimodeystviya komponentov boksita pri avtoklavnom vyshchelachivanii)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota i VNITO tsvetn. metallurgii, 1957, Nr 26, pp 120-131

ABSTRACT: The reactions of Na_2O, Al_2O_3, Fe_2O_3, TiO_2, and CaO under conditions of leaching by an NaOH solution at elevated pressure (and temperature) were investigated. It was found that no chemical reaction occurs under these conditions between TiO_2 and Na_2O, or between Fe_2O_3 and Na_2O. The presence - separately - of Ti, Fe and Ca oxides during the leaching of alumina results in diminution of the extraction of alumina in the solution, Ti oxide demonstrating this most strongly. CaO causes the formation of an insoluble Ca hydroaluminate during leaching. The simultaneous presence of Ti and Ca oxides significantly diminishes the negative effect of TiO_2 and CaO by formation of dicalcium

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An Investigation of the Reaction (cont.)

titanate. The simultaneous presence of Ti and Fe oxides during the leaching of alumina also weakens the negative effect of TiO_2 somewhat. The presence of MgO and BaO in addition to CaO increases alumina extraction in the leaching of diaspore-bemite bauxites. The best results in the leaching of bauxites by NaOH solution are attained by addition of MgO.

G S

1. Bauxite components--Reaction 2. Autoclave--Processes--Applications

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137-58-4-6569

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 36 (USSR)

AUTHORS: Belyayev, A.I., Zhemchuzhina, Ye.A., Firsanova, L.A.

TITLE: An Investigation of the Physical Chemical Properties of Aluminum Bath Electrolyte Containing Magnesium Fluoride (Issledovaniye fiziko-khimicheskikh svoystv elektrolita alyuminiyevykh vann, soderzhashchego ftoristyy magniy)

PERIODICAL: Sb. nauchn tr. Mosk. in-t tsvetn-met. i zolota i VNITO tsvetn. metallurgii, 1957, Nr 26, pp 143-161

ABSTRACT: MgF depresses the temperature of onset of crystallization of $NaF+AlF_3$ melts more than does CaF_2. The rate of solution of Al_2O_3 in melts containing MgF_2 is higher than that of melts containing CaF_2. MgF_2 increases the wetting angle of coal by $NaF+AlF_3$ melts more than does CaF_2. The critical D of melts of $NaF+AlF_3$ with added MgF_2 is greater than the critical D of the same melts containing CaF. Losses of Al in melts of $NaF+AlF_3$ with added MgF_2 are smaller than the losses of Al in melts with added CaF_2. When direct current is superimposed, the losses depend upon the D_k, while when

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An Investigation of the Physical (cont.)

$D > 0.2$ amps/cm^2, Al losses diminish. Liberation of Na at the cathode is diminished somewhat by adding either CaF_2 or MgF_2. The density of $NaF + AlF_3$ melts increases under the effect of MgF_2 to a lesser degree than under the effect of CaF_2. The electric conductivity of $NaF + AlF_3$ melts diminishes under the effect of addition of 5% CaF_2 + 5% MgF_2 a little more than under the effect of addition of 7% CaF_2. On the whole, MgF_2 exercises a more favorable effect on the physical chemical properties of the electrolyte in Al baths than does CaF_2, and it is therefore desirable to use MgF_2 as a component of the electrolyte.

I. G.

1. Aluminum coatings 2. Electrolytes--Properties--Analysis

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SOV/137-58-7-14644

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 100 (USSR)

AUTHORS: Belyayev, A.I., Firsanova, L.A.

TITLE: Melting Al-Si Alloys from Secondary Aluminum Treatment Slimes (Vyplavka splavov Al-Si iz shlamov ot pererabotki vtorichnogo alyuminiya)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota i VNITO tsvetn. metallurgii, 1957, Nr 26, pp 162-171

ABSTRACT: A description is offered of the results of laboratory and larger-scale experiments in the melting of slimes and the distillation of Al from the alloys obtained. The possibility is established of obtaining Al-Si alloys containing 50-60% Al in reduction melts. These melts, enriched by filtration under pressure, can be used to distill pure Al via an Al subchloride in a vacuum distillation furnace using graphite heaters.

L.P.

1. Aluminum-silicon alloys--Production

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BELYAYEV, A. I.

137-1958-2-2593

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 55 (USSR)

AUTHORS: Firsanova, L. A., Belyayev, A. I.

TITLE: Obtaining Pure Beryllium Chloride by Chlorinating Beryl (Polucheniye chistogo khlorida berilliya khlorirovaniyem berilla)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota i VNITO tsvetn. metallurgii, 1957, Nr 26, pp 184-192

ABSTRACT: Laboratory tests were made to ascertain the feasibility of chlorinating beryl with Cl_2 and recovering pure $BeCl_2$ from a mixture of Be, Al, Fe, and Si chlorides by vacuum distillation and re-distillation. The possibility is shown of a direct chlorination of beryl with Cl_2 in the presence of carbonaceous substances at 1200-1300°, with a resulting mixture of chlorides. Conditions of fractional distillation and vacuum re-distillation were studied in detail. The beryl used was composed of 11.5 percent BeO, 18.0 percent Al_2O_3, 60.0 percent SiO_2, 4.1 percent Fe_2O_3. Before vacuum distillation the $BeCl_2$ contained 0.6 percent $FeCl_3$ and 1.59 percent $AlCl_3$. Vacuum-distilled it contained 0.12 percent $FeCl_3$ and 0.086 percent $AlCl_3$. G. S.

Card 1/1

1. **Beryllium chloride--Production--Theory**

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BELYAYEV, A.I.

SOV/137-58-8-16634

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 55 (USSR)

AUTHORS: Vatslavik, E., Belyayev, A.I.

TITLE: An Investigation of Melts of a Cryolite-Alumina-Aluminum Fluoride-Magnesium Fluoride System as Electrolyte for the Aluminum Bath (Issledovaniye rasplavov sistemy kriolit-glinozem-ftoristyy alyuminiy-ftoristyy magniy kak elektrolita alyuminiyevoy vanny)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota, 1957, Nr 27, pp 163-177

ABSTRACT: Investigations of the physicochemical properties of cryolite melts containing MgF_2 (fusibility, density, electrical conduct-

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SOV/137-58-7-14528

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 84 (USSR)

AUTHORS: Marin, K.G., Belyayev, A.I.

TITLE: An Investigation of the Behavior of Alumina in Aluminum-bath Electrolyte (Issledovaniye povedeniya glinozema v elektrolite aiyuminiyevoy vanny)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota, 1957, Nr 27, pp 178-192

ABSTRACT: A study is made of the effect of the temperature of the calcination process and the addition of mineralizers on the phase composition of alumina (A), and of changes in the hygroscopicity of A, of the fusibility diagram of cryolite and A (α and γ modifications, and technical A) and of the relationship of the solubility of A in cryolite melts to a number of factors. It is established that rapid dissolution of A is possible when it contains 25-35% α-Al_2O_3 and when the grain size is 0.063-0.106 mm. This makes it possible to reduce calcination temperature by 100-150% (or to speed the process) with negligible rise in hygroscopicity. The addition of mineralizers on calcination in rotary ovens is undesirable because of the high consumption of

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An Investigation of the Behavior of Alumina in Aluminum-bath Electrolyte

fluoride salts. Employment of A with elevated γ-Al_2O_3 contents instead of A consisting of α-Al_2O_3 has a negligible effect on reducing the temperature of crystallization of the cryolite melt. All additions of salts to the fused cryolite inhibit A dissolution and reduce the degree of saturation of the electrolyte therewith. A standard for the amount of A to be charged at one time is established, namely, $\leq$ 8% of the amount of fused electrolyte.

L.P.

1. Alumium oxides--Processing --Properties 2. Electrolytes--preparation 3. Cryolite

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SOV/137-58-9-18739

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 84 (USSR)

AUTHORS: Garmata, V.A., Belyayev, A.I.

TITLE: Investigation of Electrode Processes in Electrolytic Refining of Aluminum (Issledovaniye elektrodnykh protsessov pri elektroliticheskom rafinirovanii alyuminiya)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota, 1957, Nr 27, pp 193-214

ABSTRACT: A study is made of the relationship of electrode potentials to current density, temperature, and melt composition in the case of a chloride-fluoride electrolyte (E) (60% $BaCl_2$, 23% AlF_3, 17% NaF) and a pure fluoride E (48% AlF_3, 18% NaF, 18% BaF_2, 16% CaF_2). It is shown that the switching method of determining potentials is not applicable to the study of this process, in view of the comparatively small rate of increase in electrode potentials, varying unevenly with cd when the current is turned on, and also in relation to the rate of drop in electrode potentials which undergoes very great and uneven changes after disconnection of the polarizing current. The use of a

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SOV/137-58-9-18739

Investigation of Electrode Processes in Electrolytic Refining of Aluminum

magneto-optical oscilloscope to investigate high-speed electrode processes is recommended. The cathodic and anodic current efficiency of either E is studied. It is found that the current efficiency is 3-4% higher with pure fluoride E, and therefore the latter is more desirable than the chloride-fluoride type. The conclusion is drawn that contamination of the cathode metal by Cu is attributable to the fact that the surface of the anode electrode becomes low in Al, and this creates conditions favorable to Cu going into the melt and being precipitated at the cathode. The study performed confirms the conclusion that the primary cathode process is the discharge of Al^{3+} ions.

N.P.

1. Aluminum--Purification 2. Electrodes--Performance 3. Electrolytes--Properties 4. Electrolytes--Chemical reactions

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BELYAYEV, A.I.

NOVIKOV, N.I.; BELYAYEV, A.I.

Investigation of the physical and chemical properties of electrolytes for industrial aluminum electrolyzers. TSvet. met. 30 no.11:46-53 N '57. (MIRA 10:11)

(Aluminum--Electrometallurgy) (Electrolytes)

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BELYAYEV, A.I.

ZHUKOVSKIY, Ye.I., prof.; BELYAYEV, A.I., prof.; KUZNETSOV, S.I., dots.

Concerning the review of the book by V.A. Mazel' "Alumina production." Tsvet. met. 30 no.11:82 N '57. (MLRA 10:11)

1. Zaveduyushchiy kafedroy "Metallurgiya legkikh metallov" Severo-Kavkazskogo gorno-metallurgicheskogo instituta (for Zhukovskiy). 2. Zaveduyushchiy kafedroy "Metallurgiya legkikh metallov" Moskovskogo instituta tsvetnykh metallov i zolota im. M.I. Kalinina (for Belyayev). 3. Zaveduyushchiy kafedroy "Metallurgiya legkikh metallov" Ural'skogo politekhnicheskogo instituta im. S.M. Kirova (for Kuznetsov).
(Alumina) (Mazel', V.A.)

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"APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000204610003-5

BELYAYEV, A.I., professor.

Important contribution to the utilization of natural resources of our country; combine treatment of nephelines. Priroda 46 no.6:41-42 Je '57. (MLRA 10:7)

1. Moskovskiy institut tsvetnykh metallov i zolota im. M.I. Kalinina. (Nepheline)

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BELYAYEV, A.I.

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): G. V. Popova; Tech. Ed.: G. G. Bakher.

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.

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BELYAYEV, A.I.

Metallurgy of the USSR (Cont.) SOV/1497

new method is undergoing tests on a semi-industrial scale in which the roasting is done at high temperature and which results in liquid products of the reaction. There are 47 references, 38 Soviet, and 9 German.

Dzyev, N.F. (Deceased). Metallurgy of Heavy Nonferrous Metals 505

This article gives an outline of the state of art of metallurgy in the USSR from 1913 to 1957. The development stages are presented in chronological order and the location of deposits, metallurgical plants, research institutes are mentioned. Some production figures are given. Some space is devoted to the production of nickel. It is stated that a new and improved method will have to be developed to improve production. The use of the carbonyl method (presumably a variation of the Mond Process) is to be adopted "within the next few years." There are 74 Soviet references.

Belyayev, A.I. The Metallurgy of Aluminum 529

The author lists bauxite and sillimanite deposits in the USSR and the plants and electric power stations used for processing alumina.

Metallurgy of the USSR (Cont.) SOV/1497

Production figures are given. It is planned to use concentrates of sillimanite for the production of aluminum and silumin. Various method of aluminum production are discussed. There are 76 Soviet references.

Gulyanitskiy, B.S. The Metallurgy of Magnesium 558

Russian geological exploration for magnesium minerals is said to have started only under the Soviet regime. The Verkhne-Kamsk deposits of carnallite are reported to amount to billions of tons. A number of saline lakes are listed as another valuable source of raw material. The bays of the Sea of Azov and of the Caspian Sea are reported to contain enough salts for commercial exploitation. Deposits of dolomite are found in most industrial areas of the USSR. Currently three methods of producing magnesium are used in the USSR: 1) electrolysis 2) reduction of magnesium oxide by ferrosilicon, and 3) reduction of magnesium oxide by carbon. Other methods are under development which will take advantage of local conditions and streamline the production of magnesium. There are 89 Soviet references.

Shabis, N.F. Development of the Metallurgy of Rare and Minor Metals in USSR 570

Rare metals are classified as follows: 1. Light rare metals Li, Rb, Cs, Be, 2. Rare earths - all lanthanoids of Sc, Y, 3. Scattered rare metals Ga, In, Tl, Ge, 4. High temperature rare metals Ti, Zr, Hf, V, Nb, Ta, Mo, W, Re, 5. Radioactive metals Ra and all actinoid elements. Mercury, tin,

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BELYAYEV, A.I.

Second World Metallurgical Congress in Chicago. Biul TSIIN tsvet. met. no.1:34-35 '58. (MIRA 11:4)
(Chicago--Metallurgy--Congresses)

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SOV/137-59-1-462

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 58 (USSR)

AUTHORS: Belyayev, A. I., Firsanova, L. A.

TITLE: Refining of Aluminum by Distillation in Conjunction With Subhaloid Compounds (Rafinirovaniye alyuminiya distillyatsiyey cherez subgaloidnyye soyedineniya)

PERIODICAL: Izv. vyssh. uchebn. zavedeniy. Tsvetn. metallurgiya, 1958, Nr 1, pp 116-120

ABSTRACT: The process of refining of Al by means of distillation (D) in conjunction with subfluoride and subchloride was investigated with the aid of a laboratory vacuum device; the behavior of impurities was studied concurrently. It was found that the behavior of the impurities is identical during D of Al with either subfluoride or subchloride. Si and Fe may be present in the initial Al in significant quantities without passing into the refined metal; Cu, Ti, and Mn pass into the refined metal more readily, where Mg, Zn, and Ca pass into the final metal so easily that their concentration in the initial Al must be kept to a minimum. The purity of refined metal varies from 99.8% Al, during D of Si-Al, to 99.999% Al during D of primary Al.

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