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SELECT AND ANNOTATED BIBLIOGRAPHY ON PRIMARY ALUMINIUM METAL *

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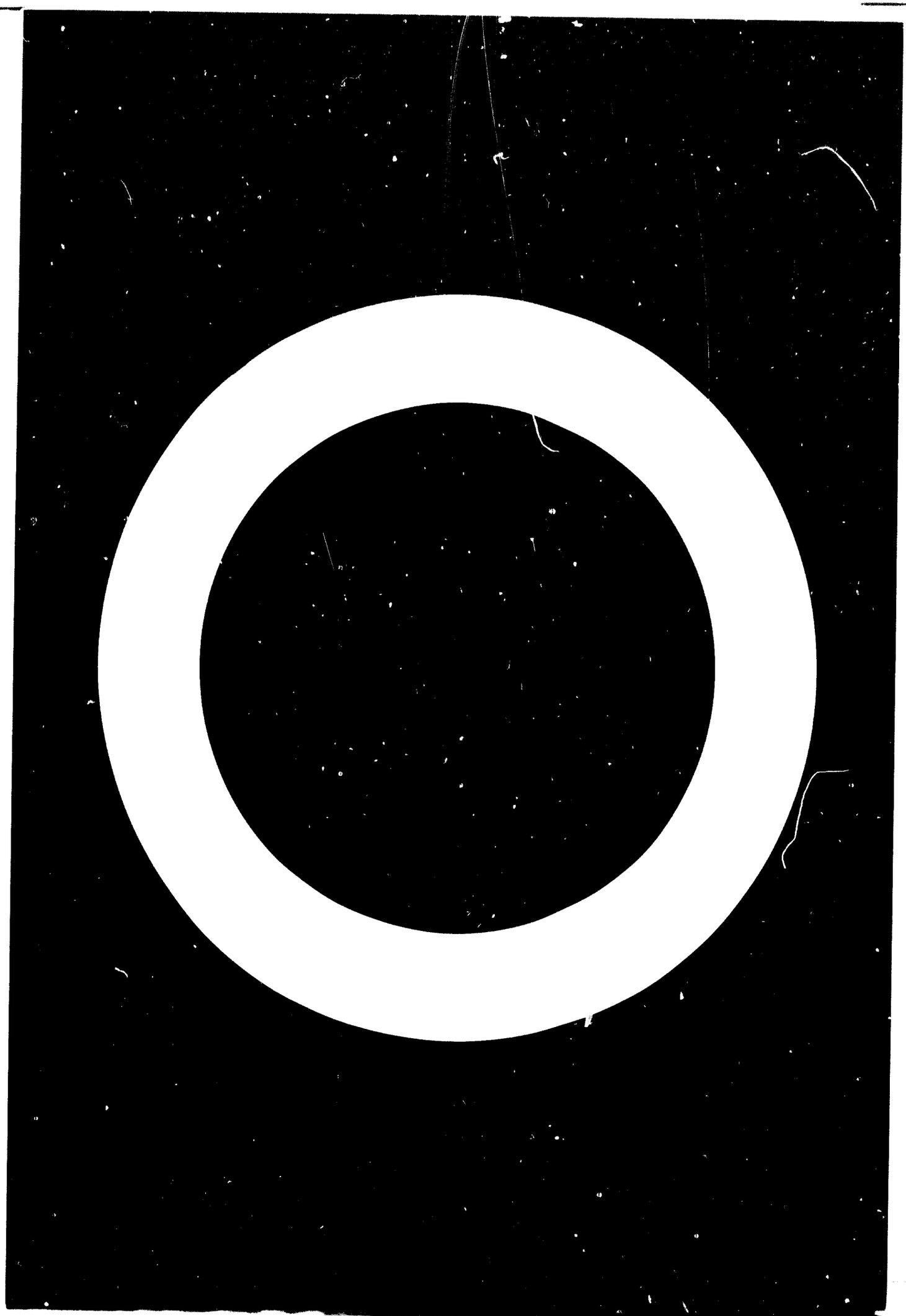

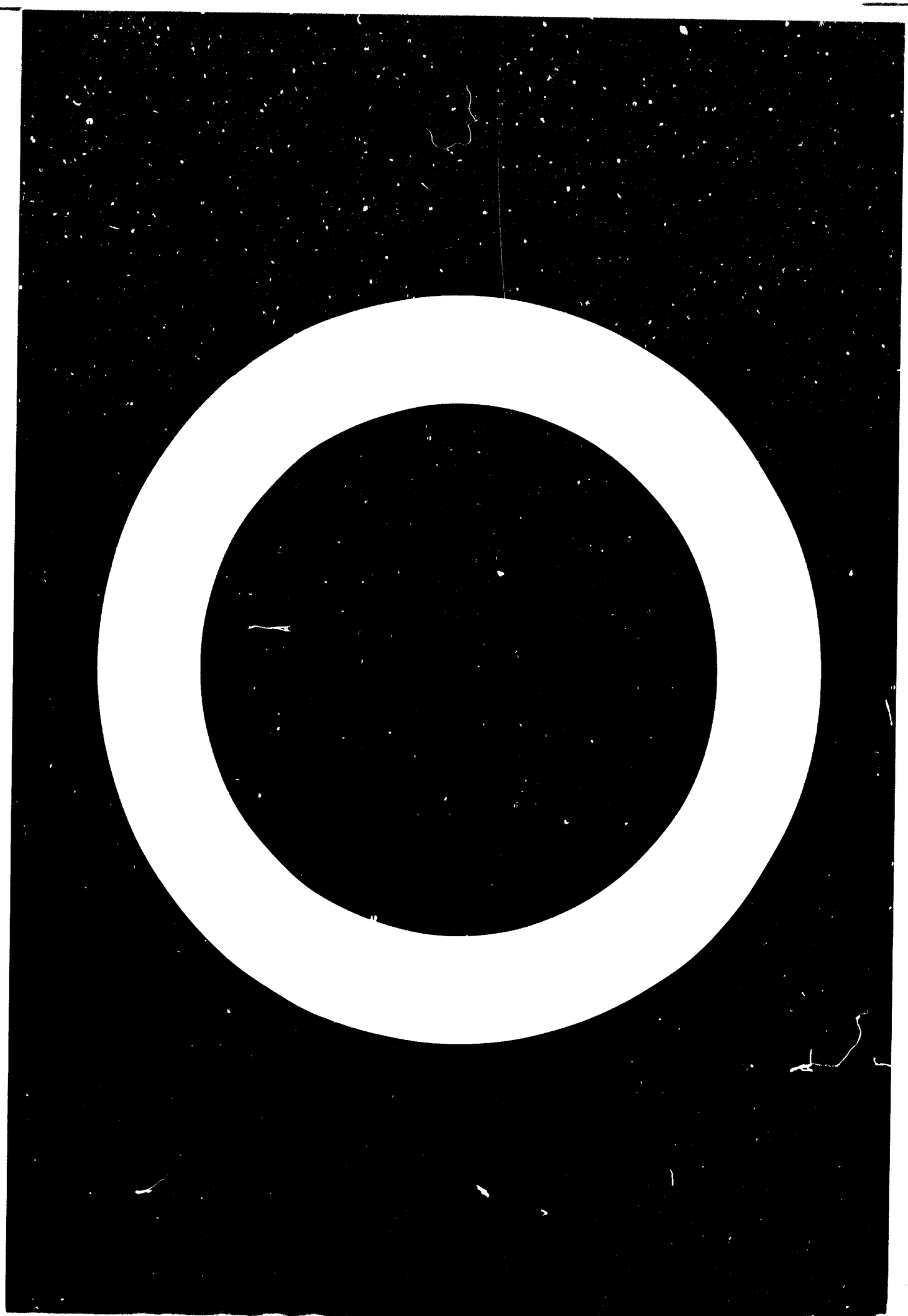

1. TECHNOLOGY OF THE ELECTROLYSIS PLANT

1. ACTON, C.F. et alii: High-voltage pulsing of a laboratory aluminum electrolysis cell. Industrial and Engineering Chemistry, Process Design and Development, Vol. 15. No.2. Apr. 1976. pp. 285-290.

   A small laboratory Al electrolysis cell has been fabricated in an attempt to reproduce experimentally the reported observation that short-duration, high-voltage pulses applied to a conventional Al electrolysis cell can significantly increase the energy efficiency for subsequent Al extraction over present practice.

2. Aluminium-manganese alloy. Kaiser Aluminum and Chemical Corp. No. 3,951,764 /1o Feb. 1975/. Official Gazette, 2o Apr. 1976. /U.S. patent/

   In the process of producing Al by electrolysis of Al_2O_3 feed in the presence of a molten fluoridic salt, which serves as a cover layer for the produced molten Al and which dissolves Al_2O_3, and wherein the produced molten Al is connected as cathode in the electrolysis.

3. BAZHENOV, A.E. et alii: Behavior of aluminum reduction cells during power supply interruptions. Cvetnye Metally, No. 6. 1976. pp. 4o-42. /Russian/

   A routine shutdown was simulated by shunting electrolytic cells away from the common circuit of the series in order to study the thermal and electrical characteristics of industrial reduction cells for currents above 150 kA.

4. BAZHENOV, A.E. et alii: The use of experimental-statistical methods for determining the electrolysis of aluminum. Cvetnye Metally, No. 1o. 1976. pp. 32-36. /Russian/

   A mathematical model of Al electrolyzer developed was used to optimize several variables of the process. Effects of inter-electrode distance, cryolite content, current and molten metal level on yield, as determined from a regression analysis of the experimental data, are presented graphically. Also presented is the cost/ton of Al as a function of some electrolyzer process variables.

5. BEGUNOV, A.I.: Electrical resistance of cells during the electrolysis of melts with horizontal positioning of electrodes. Izvestija Vysših Učebnyh Zavedenij, Cvetnaja Metallurgija, No. 2. 1976. pp. 75-80. /Russian/

Electrolytic cell parameters were established for the electrolytic separation of metals, particularly Pb, using horizontally positioned electrodes. An empirical relationship was found for the dependence of supplementary electrical resistance associated with the presence of nonconducting gas inclusions in the electrolyte of an electrolysis cell, current density, temperature and depth of immersion of the anode in the electrolyte.

6. BEGUNOV, A.I.: General dependence of gas content on the current density during electrolysis with horizontal stud anodes. Izvestija Vysših Učebnyh Zavedenij, Cvetnaja Metallurgija, No. 1. 1976. pp. 29-33. /Russian/

A general expression for a functional dependence of the gas content on the current density during electrolysis with horizontal stud anodes was derived. The expression is given as: $f = f_{max}/ai_a/1 + ai_a/$ where f and f_{max} are specific gas content for a given density of anode current i_a and maximum possible gas content, respectively; a is an empirical constant.

7. BEGUNOV, A.I. et alii: Modeling of the flotation of carbon particles in cryolite-alumina melts. Ivestija Vysših Učebnyh Zavadenij, Cvetnaja Metallurgija, No. 4. 1976. pp. 52-56. /Russian/

Stokes law was applied to the flotation of coke particles in the molten electrolyte used in the Hall process and model experiments were conducted in cryolite-alumina melts, aqueous solutions of zinc chloride and solutions of bromoform in isoamylacetate.

8. BERGE, B. et alii: The influence of operating parameters on the current efficiency in aluminum reduction cells. In: "Light Metals 1976". Vol. 1. New York. 1976. AIME, pp. 23-47.

A survey is given of earlier investigations on the correlation between current efficiency /CE/ and the parameters: bath temperatures, inter-electrode distance, anodic current density and bath composition in laboratory and commercial Al reduction cells. Recent experimental results for the effect of current density on the CE in 52 kA Soderberg cells are given.

9. BHILOTRA, K.R.K.: Utilization of compacted dusts as a means of reducing alumina losses. In: "Light Metals 1976". Vol. 2. New York, 1976. AIME, pp. 41-50.

Investigations have shown that the alumina fines mixed with the coloiner product are responsible for about 50% of the total alumina

losses from Alcan's smelting operations at Arvida while those sent to the Bayer process are only partially recovered. A novel process which eliminates completely the need to mix any alumina dusts with the calciner product or to return them to any part of the Bayer process consist of compacting the already separated alumina dusts and then feeding them to the reduction cells in the form of suitably sized granules.

10. BIKETOVA, L.V. et alii: Aluminum losses in a chloride electrolyte. Trudy VAMI, No. 92. 1975. pp. 48-51. /Russian/

An experimental study was done in quartz tubes to determine the effect of initial $AlCl_3$ concentration in $NaCl-KCl-AlCl_3$ electrolytes on Al losses while the melt is held at temperatures ranging from 700° to 1000°C for periods ranging from 1 to 7 hr.

11. BLAZEVIC, Z.: Cooling of an electrolytic furnace for production of aluminum during a power failure. Tehnika /Belgrade/, Vol. 31. No. 3. 1976. pp. 349-352. /Serbo-Croatian/

The maximum permissible time of power failure /t/ which does not lead to an irreversible arrest of the electrolytic furnace for Al production was theoretically calculated for a 140 kA cell with prebaked anodes.

12. BRATLAND, D. et alii: Thermodynamic discussion of some energy problems in Al electrolysis. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 3-21.

A detailed thermodynamic calculation of the theoretical energy input requirements of Al electrolysis is presented. This leads to a relation between the current efficiency and the energy efficiency of the process. Considering this relation the possibilities for improvement of the energy efficiency are discussed.

13. BURNAKIN, V.V. et alii: Study of the motion of electrolyte and anode gases on a high-temperature model of industrial aluminum electrolyzers with prebaked anodes. Izvestija Vysših Učebnyh Zavedenij, Cvetnaja Metallurgija, No. 2. 1976. pp. 81-85. /Russian/

Experiments were made at 700°C on a model electrolyzer to study the motion of electrolyte and gases in the space between the side wall of the electrolyzer and a prebaked anode. The rate of motion of the gas bubbles increased linearly from 15 to 40 cm/sec as the bubble diameter increased from 5 to 30 mm for current densities of 0.4-2.0 A/eq

14. Copper contacts fixed to aluminum bars on cathodes for electrolysis cells. Noranda Mines Ltd. No. 828,189 /29 Apr. 1974/. /Belgium patent/

Process for fixing a Cu contact button to the Al or Al alloy conductor bar of an electrode plate, comprises coating the Cu button with a thin

layer of Ag; mechanically screwing the Cu button in the conductor bar; preheating the assembly to 93.3° to 482°C; welding the Ag-coated Cu button to the Al bar, the solid mechanical joint obtained by screwing thus being reinforced by a strong metallurgical bond with a low electrical contact resistance.

15. DIETRICH, H.: High temperature filtration under difficult chemical conditions. In: "Proceedings of the 6th Annual Industrial Air Pollution Control Seminar", Cherry Hill, N.J. 1976. American Institute of Plant Engineers and Rossnagel and Assoc. p. 10.

Heat resistant media, both woven and needled, are now available for high-temperature filtration applications in polypropylene, acrylic, polyester, aramide, polytetrafluorethylene, mineral fibers, stainless steel and sintered metals. Uses of these materials in filters for spray drying processes, lime kilns, Al smelting ovens, steel smelting furnaces and Cu refineries are described.

16. DUBY, P.: Annual review of extractive and process metallurgy. Metallurgical processes--Electrometallurgy. Journal of Metals, Vol. 28. No. 3. 1976. pp. 8-11.

An annual review of electrometallurgy includes the CCS electrowinning cell, air sparging, periodic current reversal /PCR/, recovery from dilute solutions, fluidized bed electrodes, solvent extraction hardened Pb anodes, Ti blanks instead of Cu, leach-electrowinning, Zn electrowinning, electrolysis of salts, computer control, prebaked anodes, fundamental research, electrolysis of aluminium trichloride, production of smooth Ti plates, electrowinning pure Cr in a K and LiCl melt and the recovery pf Pb.

17. Electrolytic furnace for aluminum in which melted fluoride is inserted between carbon anode and cathode blocks. Nippon Light Metal Research Institute. No. 75. 031,609 /12 Sept. 1974/. /Japanese patent/

In an Al electrolytic furnace an electrolyte cell of melted fluoride is inserted between cathode and anode C blocks and alumina to be electrolyzed is dissolved in the electrolyte cell. A layer of foamed C material is formed on the reverse surface of the cathode C block and a layer of electrically insulating material is formed between the foamed C material and the furnace. Durability of the furnace is increased.

18. Electrolyzer automatic alumina feeder. Aluminium Magnesium Electr. Ind. Re. Inst. No. 461,973 /25 Aug. 1965/. /Soviet patent/

The proposed design insures accurate metering of the alumina with small batches fed every 2-6 min with a signal from the control unit to the solenoid air valve. The latter provides an interlock between

the vacuum batcher and the air cylinder, whose piston carries the freely mounted tool for breaking the crust in the electrolyzer.

19. EVMENOV, V.A. et alii: Refinement of the baking of high-power electrolyzer with an upper current lead. Cvetnye Metally, No. 11. 1975. pp. 32-35. /Russian/

It is shown that the baking of anodes, after first pouring the liquid Al into the basin and subsequent forming of the anode on the hardening metal, makes it possible to increase the reliability of the anode basin contact and to improve the heat distribution in the basin and the current distribution along the anode.

20. FROLOVA, E.B. et alii: The effect of phosphorus pentoxide on the operation of an aluminum cell. Trudy VAMI, No. 89. 1974. pp. 36-39. /Russian/

The effect of the raw material impurity, phosphorus pentoxide, on Al cell temperatures was studied. The phosphorus pentoxide content of aluminium fluoride, obtained from superphosphate plants, can be as high as 0.008-0.014%.

21. FURMAN, A.; FEMENIA, F.: Temperature-time relationship in an aluminum reduction cell. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 245-273.

The time evolution of temperature in a prebaked anode Al reduction cell was studied during preheating. Electric current distributions for both anodic and cathodic systems were obtained along with the corresponding Joule heat generation. A model was developed to calculate corrections for the electric currents taking into account perturbations on cathodic and anodic distributions.

22. GEFTER, S.E.: Modeling the magnetic hydrodynamics of aluminum cells. Trudy VAMI, No. 89. 1974. pp. 13-18. /Russian/

The melt circulation and undulation occurring in the Al cell as a result of electrodynamic forces were mathematically modeled. Maxwell and Naiver-Stokes equations were applied to the analysis. Magnetic induction was equated to electric field intensity.

23. GOODNOW, W.H.: Cell resistance and alumina addition. Kaiser Aluminum and Chemical Corp. Paper from "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 295-314.

The relationship between the total voltage drop of a reduction cell and the alumina concentration of the electrolyte has been well documented. Several strategies have been proposed which use this relationship for alumina addition control. Pilot cells under this type of control have been operated for several years with excellent operating results.

24. GRJOTHEIM, J. et alii: Formation of aluminum carbide at the graphite/ /cryolite interface. Metall, Vol. 30. No. 6. 1976. pp. 546-547. /German/

Preliminary results of a general investigation into the formation of Al_4C_3 in molten flux electrolysis are given. Cylindrical graphite crucibles of base 26 x 6 mm and height 35 mm were used. Into these were introduced mixtures of 10 g natural cryolite, 2 g Al 99.999 and 0-10 wt % Al_2O_3. The crucibles were heated to 1050°C in an inert gas atmosphere and held at this temperature for 4 hr.

25. GROBEINY, M.: Sodium fluoraluminates formed in the reaction between aluminum fluoride solution and crystalline sodium fluoride. Journal of Fluorine Chemistry, Vol. 8. No. 2. 1976. pp. 133-144.

The reaction of AlF_3 solution with crystalline NaF was investigated. Conditions for the formation of Na_3AlF_6 /cryolite/, $Na_5Al_3F_{14}$ /chiolite/ and $NaAlF_4.H_2O$ were established. The hitherto presumed to be unstable $NaAlF_4.H_2O$ was isolated and its X-ray diffraction data as well as thermal behavior were determined. The possibility of interconversion of these compounds into one another is outlined.

26. HAUPIN, W.E.: Cathode voltage loss in aluminum smelting cells. Aluminium, Vol. 52. No. 7. July 1976. pp. 446-448.

Components of cathode voltage loss and cathode temperatures in Al smelting cells were measured using electrically insulated internal probes and thermocouples. In normal operations, the voltage drop between Al and lining was insignificant. Lining voltage loss decreased from 0.35 ± 0.05 V initially to 0.09 ± 0.02 V with age as the lining graphitized.

27. HAUPIN, W.E. et alii: Identification of metal fog in electrolysis of aluminum chloride. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 159-169.

Electrolysis of $AlCl_3$ in a NaCl-KCl melt produced metal fog and streamers at the cathode, giving a broad absorption band in the visible spectral region at wavelengths extending past 700 nm. The fog and streamers quickly disappeared when electrolysis was terminated. A melt in which Na was dissolved had a similar absorption band.

28. INNVAER, R.; OLSEN. L.: Temperatures in Soderberg electrodes in unsteady state conditions. Eighth Congress of Union International d'Electrothermie, Liège, Belgium. 1976. p. 12. /Preprint/

A dynamic computer model has been developed for simulating unsteady state electrode operation. The dynamic mathematical model and its computer program are briefly described. Electrode parameters, such as the electric current, slipping rate, position in furnace and thermal environment, can be varied as a function of time.

29. ITOH, K.; NAKAMURA, E.: On the structural entities of electrolytes and the electrode reactions in aluminum electrolysis. Sumitomo Light Metal Technical Report, Vol. 17. No. 1,2. Jan. 1976. pp. 61-82. /Japanese/

A comment on the phase diagram for the system NaF-AlF_3, a dissolution model of NaF-AlF_3, melting mechanism of alumina in Na_3AlF_6 and a cathode reaction and anode reaction in Al electrolysis are presented. The problems on the structural entities and the electrode reactions, for example, ionic structure of electrolyte Na_3AlF_6-Al_2O_3, overpotential of cathode reaction, mechanism of anode reactions, for example, are discussed.

30. IVANOV, V.A. et alii: Construction of a mathematical model of the electrolytic production process for aluminum. Izvestija Vyšših Učebnyh Zavedenij, Cvetnaja Metallurgija, No. 4. 1976. pp. 129-136. /Russian/

Mathematical equations were written for several portions of the process of electrolytic manufacture of Al. The basis of the mathematical model was Faraday's law for extracting Al from Al_2O_3 in an electrolyzer. Using the system of equations, optimization of process control is proposed.

31. JENSEN, E.A.: Design and start-up of a recently built carbon electrode complex for an aluminum reduction plant in West Germany. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 389-405.

Design decisions are compared with the actual start-up and operating experiences for the anode mixing, forming and baking plants as well as the cathode paste plant. Studies were made on batch or continuous mixing, the use of liquid or solid pitch, press or vibration forming of anodes and closed or open top baking furnace.

32. KACHANOVSKAYA, I.S.; ARKELYAN, O.I.: Behavior of alumina in the precipitates and skull of an aluminum reduction cell. Cvetnye Metally, No. 4. 1976. pp. 37-40. /Russian/

A study was made on the stability of hardened slag crusts and sediment in an Al electrolyzer. It was shown that the Al_2O_3 in the crust is present in the form of alpha-Al_2O_3 aggregates with a fine-grained and needle-like structure. The amount of Al_2O_3 in the crust is insignificant. The composition of the crust and sediment and the crystal size varied with the cell operation. The Al_2O_3 content and grain size increased whereas the NaF content decreased in the crust and sediment with aging.

33. KACHANOVSKAYA,I.S.,: Electrolyte circulation in the interelectrode space of an aluminum cell. Trudy VAMI, No. 89. 1974. pp. 40-45. /Russian/

The fluid circulation in the interelectrode space of self-baking anodes of Al cells was studied. The effects of current strength, from 1.5 to 6 kA, an interelectrode gap, from 8 to 16 cm, were established. Flowline charts are shown for different conditions. Increasing anode width results in an increased rate of electrolyte circulation.

34. KEROUANTON, A.; PLICHON, V.: Effect of several factors on voltammetric curves at a carbon electrode in cryolite melts with low alumina content. Comptes Rendus, Académie des Sciences de Paris, Ser. C. Vol. 280C. No. 10. 1975. pp. 629-632. /French/

The addition of Al_2O_3, the increase in the anodic surface or the elevation of the temperature cause the anode effect to appear on voltammetric curves obtained in an Al_2O_3-poor cryolite bath. A process of activation-passivation, based on the electrochemical oxidation of C in the presence of the O^2-species, is the source of the phenomenon at high Al_2O_3 contents.

35. KEROUANTON, A.; PLICHON, V.: Voltametry at a carbon electrode in cryolite-alumina melts. Comptes Rendus, Académie des Sciences de Paris, Ser. C. Vol. 280C. No. 8. 1975. pp. 497-500. /French/

Several activation-passivation processes at the C anode can be distinguished by studying the voltametric curves obtained in an Al_2O_3-poor /0.3 wt%/ cryolite bath. Both CO and CO_2 are produced simultaneously at the anode. Both graphite and vitreous C anodes were studied.

36. KORITZEV, I.A. et alii: Study of gas-filling of an industrial electrolyzer to control the process according to the composition of anode gas. Izvestija Vysših Učebnyh Zavedenij, Cvetnaja Metallurgija, No. 1. 1976. pp. 59-63. /Russian/

The magnitude and the extent to which different errors, introduced into the system through instrument readings, air inflow in the bell or by errors introduced by incorrect sampling of the air, can influence the gas filling in an industrial electrolyzer, are determined. In addition, the dynamic properties and the changes and nature of the gas under the gas collecting bell have been studied. The largest error is introduced into the system via air inflow.

37. KOZMIN, G.D. et alii: Dissolution of alumina in the electrolyte of an aluminum reduction cell. Cvetnye Metally, No. 7. 1976. pp. 31-32. /Russian/

A major role in the alumina feed is ascribed to the dissolution of the cryolite-alumina crust by the electrolyte circulation between additions. The cell is partially supplied with alumina in the

precipitate occurring during the extinction of the anode effect. Laboratory tests indicated that alumina was retained at the metal--electrolyte interface.

38. KRYUKOVSKII, V.A. et alii: Technology of the start-up of high-capacity aluminum electrolytic cells after temporary shut-down. Cvetnye Metally, No. 1. 1976. pp. 41-43. /Russian/

The major problem of heat-up in start-up of high-capacity Al electrolytic cells after temporary shut-down, such as due to an unexpected interruption of the electric power supply for a few days or a month, is the lack of uniformity of the current distribution in the anode and cathode. Pouring in liquid Al in quantities sufficient to create good contact between the anodes and cathodes solves the problem.

39. LESS, L.N.: The crusting behavoir of smelter aluminas. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 315-329.

Aluminas having a wide range of physical characteristics were added in the laboratory to cryolite melts under different, controlled conditions of temperature and melt composition. Crusts were usually obtained, and their strengths, durability and solubility noted.

40. MARTINSON, I.G. et alii: Calculating the electrical fields of a horizontal-stud Soderberg anode. Trudy VAMI, No. 89. 1974. pp. 29-35. /Russian/

A mathematical grid model was used to determine the effect of current flow at the bottom of a cell on the electrical fields of the anode. The conditions chosen were 140 kA current strength, 280 x 20 x 30 cm anode dimensions and a current density of 0.762 A/sq cm.

41. MORI, K. et alii: The surface oscillation of liquid metal in aluminum reduction cells. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 77-95.

Oscillations of a long period occurring at the interface between the electrolyte and the molten cathode metal decrease the effective interpolar distance. As a result the cell becomes unstable and the current efficiency decreases. The oscillation can be estimated by measuring the current of the anode conductors.

42. MORRIS, D.R.: A mathematical model of the alumina reduction cell. In: "Molten Salts". Princeton, N.J. 1976. Electrochemical Society, pp. 469-477.

Based upon the equations of irreversible thermodynamics, and assuming local equilibrium, expressions are developed for the cell performance parameters of the Al_2O_3 reduction cell. A fundamental assumption of the model is that the electrolyte is a partial electronic conductor by virtue of the solubility of metal in the electrolyte.

43. MYERS, D.L.; PARSONS, R.H.: Insurance of reduction operations stability using dynamic maintenance system approach. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 287-293.

A dynamic system of maintenance was developed to optimize the cost of physical asset protection by: effectively planning, controlling and reporting on the maintenance activities, improving equipment reliability, maximizing the useful life of equipment, determining and maintaining an equipment uptime level to meet finished product delivery schedules and minimizing production losses due to equipment downtime.

44. NIEHAUS, H.E.: Reduction cell removal with a telescoping strongback. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 149-156.

A method and the necessary equipment are described for pot shell removal when the existing potroom cranes do not have the sufficient capacity to lift a shell that has not had the lining removed. The equipment used is a portable strongback which can be lifted with the existing potroom cranes and is used in conjunction with them.

45. NIKITIN, A.V. et alii: Study of the gas filling and the flow rate of the anode gases in powerful aluminum electrolyzers. Cvetnye Metally, No. 8. 1975. pp. 31-35. /Russian/

The gas filling and the pressure of the anode gases were measured in an Al electrolyzer and the results were used to calculate the flow rate of the anode gases. The results confirmed the local character of the anode effect. The measurement of the flow rate by means of a pneumometric tube allowed a new model to be developed for the flow of gases and liquids in the interpolar gap.

46. OSTAPENKO, R.I. et alii: Maintaining the field current in aluminum reduction cells with the PTE-1 fine current adjuster. Cvetnye Metally, No. 3. 1976. pp. 39-40. /Russian/

The use of a current controller PTE-1 for additional feeding of Al electrolytic cells was described. The controller is a three-phase bridge controlled rectifier with main voltage 0.4 kV, nominal rectified current 6.3 kA and nominal rectified voltage 6 V. The use of additional feeding reduced non-uniformity of temperature distribution while the average temperature of the bottom in the vicinity of anode was 100° to 120°C.

47. PETERSON, R.W.: Temperature and voltage measurements in hall cell anodes. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 365-382.

Fifty thermocouples and 30 voltage probes were placed in each of two anodes for recording data during 24 hr of operation. One of the anodes was set to the proper height in the bath and the other was set 1 in.

lower. Current overloading was severe in the low anode, resulting in stud overheating and current imbalance.

48. PORSBLOM, G.V.: Approximate mathematical description of electrolyte hydrodynamics in the interpolar space of an aluminum cell. Trudy VAMI, No. 89. 1974. pp. 5-12. /Russian/

The effect of anode gases on hydrodynamics in an Al cell was analyzed theoretically. A two-dimensional analysis of the motion of an electrolyte in the interpolar space is made. Horizontal and vertical velocity gradients are shown graphically and presented in equation form.

49. Production of carbon lining for reduction cells. Alcan Research and Development Ltd. No. 3,932,244 /19 Dec. 1973/. Official Gazette, 13 Jan. 1976. /U.S. patent/

50. RATKJE, S.K.; PORLAND, T.: Aluminum-oxy fluorides in cryolite melts. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 223-240.

Cryoscopic measurements showing the presence of the complex $Al_2OF_{2x}^{4-2x}$ as the complex first formed upon solution of oxides in AlkF-Alk_3-AlF_6--melts are presented. The alkali metals are Na and K. The onset of the anode effect in technical Al electrolysis is explained as due to a shift at low oxide contents in the melt equilibria which concerns the Al-oxy fluorides.

51. RATKJE, S.K.: Oxy-fluoro aluminate complexes in molten cryolite melts. Electrochimica Acta, Vol. 21. No. 7. July 1976. pp. 515-517.

Cryoscopic measurements on the KF-rich side in the system KF-AlF_3-K_2O-Al_2O_3 are presented. Amounts of K_3AlF_6 and K_2O added to KF are so small that an ideal Henrian behavior of the solution can be expected. The results, which indicate complex formations with the $Al_2OF_{2x}^{4-2x}$ complex as the dominating species for atomic ratio O/Al less than 0.3 and K_3AlF_6 molar fraction less than 0.005, agree with similar investigations of the corresponding Na system.

52. RICHARD, M.C. et alii: A new approach for comparing the impact on magnetic fields from pot design alterations. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 109-130.

During the life of an Al reduction plant, it is often necessary to revise the cell design to meet either new environmental requirements or material shortages. A family of computer programs has been developed to define the forces due to the magnetic field of the existing cell, define the forces due to the magnetic field of the revised design.

53. ROBL, R.F.: Magnetics improvement devices to reduce metal movement. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 97-108.

Molten metal flow patterns in electrolysis cells can be changed by modifications of either electrical current patterns or magnetic field patterns within the molten metal. Electrical current patterns are mainly determined by anode current balance. Magnetic field patterns are mainly determined by geometry of the currents, but are also strongly influenced by disposition of magnetic materials.

54. ROLLAND, P.: MANANTOV, G.: Electrochemical reduction of $Al_2Cl_7^-$ ions in chloroaluminate melts. Journal of the Electrochemical Society, Vol. 123. No. 9. Sept. 1976. pp. 1299-1303.

The electrodeposition of Al at glassy C, Pt and W electrodes in slightly acidic chloroaluminate melts has been studied using cyclic voltammetry, chronopotentiometry, chronoamperometry and related techniques. The reduction of $Al_2Cl_7^-$ ions involves a nucleation process at glassy C electrodes and, to a lesser extent, at the Pt and W electrodes. At Pt electrodes alloy formation is also involved.

55. SAJDAK, R.: Coefficient of current division in aluminum electrolytic cells. Rudy i Metale Niezelazne, Vol. 21. No. 10. 1976. pp. 396-401. /Polish/

An account is given of investigations made to eliminate the harmful effect of the magnetic field in alumina electrolysis. Attention was given to certain simplifications of known formulas to which supplements were introduced as a result of which the component of magnetic induction is considered as a function of the random variable alpha /coefficient of current division/ and the working cycle of the anode.

56. SAKSVIKROENNING, T. et alii: Estimation of states in aluminum reduction cells applying extended Kalman filtering algorithm together with a non-linear dynamic model and discrete measurements. In: "Light Metals 1976", Vol. 1. New York, 1976. AIME, pp. 275-286.

A multivariable state estimator of an Al reduction cell based on a dynamic model for the energy and mass balance of the cell is presented. The state estimator used a reduced version of this model together with Kalman-filter techniques. The states have a real physical meaning such as: the mass of Al, the mass of dissolved Al_2O_3 in the bath, the temperature in the bath, the mass of the side freeze, etc.

57. SIMON, D.: Reducing the consumption of electric energy at the Slatina Aluminum Works. Metallurgia, Vol. 27. No. 6. June 1975. pp. 296-297. /Rumanian/

Proposals are made to reduce the consumption of electrical energy at the Slatina Aluminum Works by reducing the operating voltage in the

electrolysis tanks and decreasing the number and duration of the anode effects. The problems arising from the weakening of the insulation provided by the concrete base on which the tanks are mounted and from short circuits in the electrolysis line are discussed.

58. SIRAJEV, N.S. et alii: Effect of process conditions on electrolyte gas filling and resistivity. Cvetnye Metally, No. 7. 1976. pp. 33-35. /Russian/

Studies on electrolyte gas filling and resistivity were made on vertical-stud Soderberg anode cells with the cryolite ratio, electrolyte temperature, alumina concentration and interpolar gap the same in all tests. A method of dimensional analysis was used to determine the gas filling as a function of the parameters governing it.

59. STERTEN, A.; HAMBERG, K.: The $NaF-AlF_3-Al_2O_3-Na_2O$ system. Activities of aluminum fluoride and sodium fluoride in melts saturated with alumina. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 203-221.

The electromotive force of formation and concentration cells in $NaF-AlF_3$ melts saturated with alumina was determined at 1278°K. The activities of NaF and AlF_3 as a function of the molar ratio NaF/AlF_3 were derived from the results. Transport properties of cryolitic melts are also discussed. The results indicate that practically all the current is transported by Na ions around the cryolite composition.

60. TERENYI, S.: Application of refractory linings with silicon oxynitride binder in aluminum reduction cells. Bányászati és Kohászati Lapok, Kohászat, Vol. 108. No. 8. Aug. 1975. pp. 367-370. /Hungarian/

61. THONSTAD, J.; BOLSETH, S.: An electroanalytical method to assess the concentration of dissolved metal in cryolite baths. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 171-182.

Metal dissolved in cryolite melts can be oxidized anodically on Pt electrodes. A limiting current is observed which is a measure of the concentration of oxidizable species. The limiting current density increases with increasing NaF/AlF_3 ratio and with increasing Al activity.

62. THONSTAD, J.: ROLSETH, S.: Anodic oxidation of aluminum dissolved in cryolite melts. In: "Molten Salts". Princeton, N.J. 1976. Electrochemical Society, pp. 393-399.

Aluminum dissolved in cryolite melts was oxidized anodically on Pt electrodes. A limiting current was observed which increased with increasing Al activity. The results are interpreted in terms of monovalent Al as the predominant oxidizable species together with Na. The limiting current density increased with increasing NaF/AlF ratio.

63. THONSTAD, J.: Semicontinuous determination of the concentration of alumina in the electrolyte of aluminum cells. Metallurgical Transactions, Ser. B. Vol. 8B. No. 1. Mar. 1977. pp. 125-130.

The concentration of Al_2O_3 in Al cell bath was determined by a semicontinuous chronopotentiometric method using a graphite electrode immersed in the bath, was assessed by a dilution technique with LiCl as additive.

64. URATA, N. et alii: Behavior of bath and molten metal in aluminum electrolytic cell. Journal of the Japan Institute of Light Metals, Vol. 26. No. 11. 1976. pp. 573-583. /Japanese/

Inclination and oscillation of the bath/liquid metal interface in Al electrolytic cells are barriers to be overcome for enlargement of the cell and economy of energy consumption. The instability of the interface is theoretically explained in detail on the basis of electromagnethydrodynamics. A guide for the optimum arrangement of busbars is suggested to design the cell on enlarged capacity and energy economy.

65. VENERAKI, I.E. et alij: Thermal conductivity of cryolite melts. Inženerno-Fizičeskij-Žurnal, Vol. 30. No. 5. 1976. p. 929. /Russian/

The effective thermal conductivities of cryolite and of electrolyte melts of Al electrolysis at 1000° to 1100° and 940° to 1040°C, respectively, were measured in graphite cells by the nonstationary method of coaxial cylinders. The effective thermal conductivity increased with increasing thickness of the layer of the material measured, which was explained as being due to heat transfer by radiation.

66. VETYUKOV, M.M.; DYBLIN, B.S.: Aluminum-cryolite alumina melt studied by anodic chronopotentiometry. Electrohimija, Vol. 11. No. 3. 1975. pp. 504-506. /Russian/

Anode chronopotentiometry was used to study the nature of dissolved Al in cryolite melts and the kinetics of the anode process. By changing the activity of liquid Al, using the appropriate Al-Na alloy, and determining the relative solubilities of Al, both Na_2F and AlF were shown to exist in the melt. The calculated values of the diffusion coefficients were anomalously large. In addition to the usual translational mechanism of diffusion, an additional mechanism, related to electron jump, is apparently present.

67. VETYUKOV, M.M. et alii: Anode effect during electrolysis of cryolite--alumina melts. Žurnal Prikladnoj Himii, Vol. 48. No. 10. 1975. pp. 2306-2307. /Russian/

The anode effect was studied under potentiostatic conditions by measuring the anode potential with a sensitivity of ± 5 mV, which

was obtained by using the differential input of an oscillograph. The experiment was carried out in a B carbonitride vessel previously impregnated with the electrolyte.

68. WITTNER, H.: How to influence the energy consumption by ledge profile and metal pad. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 49-55.

An improvement of the voltage stability of electrolytic cells was obtained by means of a steep ledge profile, extending only a little under the anodes and by increasing the depth of the metal pad. By stabilizing the cells, the voltage, V_{total}, could be decreased by 0.20 V, saving 0.62 kWh/kg Al.

69. X-ray analysis sampling of aluminum electrolytic bath. Mitsubishi Chemical Industries Ltd. No. J5 1079,389 /6 Jan. 1975/. /Japanese patent/

X-ray of Al electrolytic bath samples comprises: raw material of analysis is cooled, solidified, extruded and resulting product is crushed with removal of Al grains contained in it, raw material is sifted, Al crushed into plate form is eliminated and only crushed material is extracted; and extracted raw material is crushed to a very fine powder.

70. ZHULIN, N.V. et alii: Effect of temperature and flocculants on the precipitation rate of particles in a cryolite suspension. Zurnal Prikladnoj Himii, Vol. 48. No. 4. 1975. pp. 883-885. /Russian/

Soap shavings of the composition $C_{17}H_{35}COONa$ were added to an industrial cryolite suspension in the form of aqueous solution containing 3.5-75 mg soap/l. The cryolite suspension contained NaF 5.72, Na_2CO_3 44.52, $NaHCO_3$ 3.24, and suspended solids 14.52 g/l.

71. ZUCA, St. et alii: The decomposition potential of Al_2O_3 and SiO_2 in the electrolyte of industrial baths for aluminum making production. Metallurgia, Vol. 27. No. 6. 1975. pp. 317-321. /Rumanian/

The decomposition potential, E_d, of Al_2O_3 and SiO_2 in the electrolyte of industrial baths has been determined by the method of I-E curves. Several experiments were carried out with graphite, Al and Al-Si alloy cathodes and the influence of SiO_2 additions on decomposition potential of Al_2O_3 under various conditions has been studied.

2. NEW PROCESSES FOR THE PRODUCTION OF PRIMARY ALUMINUM

72. Aluminum chloride production by reacting activated alumina with chlorinating and reducing gas/es/. Aluminium Suisse SA. No. 2540,063 /19 Sept. 1974/. /German patent/

Production of $AlCl_3$ from Al_2O_3 is improved by subjecting technical aluminum hydroxide to dehydration to obtain active Al_2O_3 having low residual water content and large specific surface area; and reacting the Al_2O_3 with a chlorinating and reducing gas or gas mixture $AlCl_3$ produced by this method is suitable for electrolytic manufacture of Al on industrial scale because of the low cost.

73. Aluminum chloride production from raw materials. Aluminium Suisse SA. No. 2540,064 /19 Sept. 1974/. /German patent/

Aluminum chloride is produced from Al_2O_3 containing raw materials by dehydrating the Al_2O_3 material to convert it into an active form containing a small amount of residual water and having a large internal specific surface area, and reacting the Al_2O_3 with a chlorinating and reducing gas or gas mixture. The reaction of the Al_2O_3 is rapid and complete and the process does not require the use of catalysts, phosgene and reactors of special type.

74. Aluminum from alumina by dry smelting process using nickel /oxide/, iron oxide or copper /oxide/ additives and carbon. Agency of Industrial Sciences and Technology, No. 74 046,441 /19 Aug. 1970/. /Japanese patent/

A powdered ore containing Al_2O_3 is mixed with NiO or Ni, 0.2-1.7, CuO or Cu 0.2-1.6, and/or Fe_2O_3 0.1-0.9 moles/mole of Al_2O_3 contained in the ore. A carbonaceous material is added in a stoichiometric amount required to reduce all the oxides in the ore and additives. Briquets or pellets are formed and reduced at 1600° to 2000°C to obtain an Al alloy, which is reacted with $AlCl_3$ /g/ to recover Al.

75. Aluminum process. Ethyl Corp. No. 3,954,443 /1 July 1974/ Official Gazette, 4 May 1976. /U.S. patent/

A process for producing substantially pure Al from a raw kyanite ore.

76. Aluminum production from kyanite by carbothermal reduction followed by decompoeition of the resulting aluminum-silicon alloy by reaction with propylene and hydrogen. Ethyl Corp. No. 415,475 /2 Aug. 1972/ /Britieh patent/

77. BAIMAKOV, A.Yu. et alii: Carbothermic reduction of alumina as a function of briquet temperature. Trudy VAMI, No. 89. 1974. pp. 67-68. /Ruseian/

The mechanism of carbothermic reduction of alumina was studied. Conditions of forming Al by this process were optimized, especially briquet heating rate. Briquets made of stoichiometric amounts of Al_2O_3 and C were heated in a reaction zone at temperaturee ranging from 1700° to 2450°C. Below 1900°C, the rate of reduction was slow, but above 1900°C the rate inoreased eignificantly. At 2400°C, the reaction finished within 60 sec.

78. BARAT, P.J. et alii: Extractive metallurgy of aluminum. Aluminium Pechiney. Tech. Ing., Metall., Vol. 20. No. M65. 1976. pp. 57-88. /French/

A review on Al minerals, extractive metallurgy, refining and uses of Al.

79. BLOCH, E.A.: Alternative prooseees for the production of aluminum. Proceedings of information oonferenoe "Technology for Mankind", Basle, Zürioh, 1976. Schweizeriecher Ingenieur- und Architekten-Verein, pp. 131-149.

The advantages and disadvantages — inoluding environmental problems — of the various alternative proceeses for Al production are oonsidered and the need to reduce consumption of coal and electrical energy as well as other raw materials is pointed out. The following proceeees are discussed in detail: the Bayer-Heroult proceee /with material and energy balance/, the Alusuisee proceee, the Pechiney H^+ proceee, the Alcoa process and the Toth prooeee.

80. Carbo-chlorination of $AlPO_4$. Aluminum Corp. No. 3,935,297 /19 Dec. 1973/. Official Gazette, 27 Jan. 1976. /U.S. patent/

A proceee of anhydrous carbo-chlorination of $AlPO_4$ compriees the etepe of introducing $AlPO_4$-containing material into a reactor zone, introducing Cl and carbonaceous material into said reactor zone; heating the reactor zone to a temperature of from 600° to 1200°C to form aluminum chlorides, phosphorous oxidee, phosphorous chlorides, phosphorous oxychloridee and carbon oxidee; separating the reaction products into three fractions by condensation.

81. Carbothermic production of aluminum. Reynolds Metals Co. No. 3,929,456 /17 Oct. 1973/. Official Gazette, 30. Dec. 1975. /U.S. patent/

A carbothermic process for the production of Al from an aluminum oxide comprises: striking an open electrical arc to a portion of the surface of a charge comprising an aluminum oxide and at least one material selected from the group consisting of C, Al compounds containing C, and mixtures thereof.

82. DAHLMANN, H.-J.: Critical survey of possible substitutes for the aluminum-molten flux electrolysis. Erzmetall, Vol. 29. No. 3. 1976. pp. 125-129. /German/

The Al molten flux electrolysis according to Hall and Heroult has remained practically unchanged in the course of time as far as technology is concerned but its economy has considerably improved. Because of the relatively high consumption of energy and the high requirements for the purity of the alumina and the associated dependence on bauxite, attempts to find a substitute for the molten flux electrolysis are constantly being made. It is shown that pure Al cannot be obtained through electrothermic reduction in a single-stage process.

83. EDWARDS, M.R.; LOVERING, D.G.: Second progress report on recent advances in extraction metallurgy. Pt. B. Electrometallurgy--electrowinning and refining. International Metallurgical Reviews, Vol. 21. Sept. 1976. pp. 123-128.

For Al, slightly larger Hall-cells are theoretically possible, research on the anode effect continues and evidence indicating absence of cathodic overpotential may rank important. New processes at lower temperature and/or showing lower infrared losses are desirable. The Toth chemical process via $AlCl_3$ using Fe/Mn is essentially continuous but high-pressure, high-temperature technology is expensive. The Alcoa process of electrowinning from chloroaluminate melts is much more promising; patent details are given.

84. Epsilon-aluminum fluoride by evaporating aqueous HF solution of AlF_3 under vacuum to dryness and heating. No. 3,929,415 /26 Oct. 1967/. Official Gazette, 30 Dec. 1975. /U.S. patent/

A method for preparing epsilon-aluminum fluoride is characterized by an X-ray diffraction pattern with peaks at angles of diffraction of /in degrees/ 8.1 /very strong/, 18.8 /strong/, 24.8 /very strong/, 26.4 /strong/, 28.1 /strong/ and 50.8 /strong/ with spacings in A of 10.915A, 4.719A, 3,590A, 3.370A, 3.175A and 1.797A, respectively.

85. Fluidised bed desubliming apparatus for recovery of aluminum chloride. Aluminum Co. of America, No. 3,930,800 /29 Aug. 1973, 14 Sept. 1971/. Official Gazette, 6 Jan. 1976. /U.S. patent/

Apparatus for effecting the desublimation of gaseous aluminum chloride to solid form compriese: chamber means for confining a self-replenishing fluidizable bed of particles of aluminum chloride; a gas distribution plate defining the bottom of the fluidizable bed of particles; a gas distribution inlet disposed beneath the distribution plate for introduction of eubstantially aluminum chloride free gas into the chamber to maintain the bed of particles of aluminum chloride in fluidised condition.

86. GRJOTHEIM, J. et alii: Poesibilitiee for developing the Hall-Heroult procese. Aluminium, Vol.51. No. 10. 1975. pp. 634-637.

The Hall-Heroult procese is relatively speaking a very energy-intensive procese. This ie the reason why the Al industry is among the largest energy consumers. The future possibilitiee for developing the Hall-Heroult procees are discussed with special reference to additives, very high voltages, carbide formation and cell construction. In the near future the Hall-Heroult procees will continue to be the most important method of Al production.

87. GRJOTHEIM, J. et alii: The Alcoa and Toth procesees of aluminum production--outline and comparison. Aluminium, Vol. 51. No. 11. 1975. pp. 697-699.

The eearch for new methode of Al production has been intensified in recent years. Two proceeses developed as a result of theee efforte, the Alcoa and Toth procesees, have in common that Al is produced from aluminum chloride. Extensive research is being carried out into the industrial application of these two processes which, technologically, are completely different. The Alcoa procees is based on electrolyeis whereas the Toth procees works by indirect carbothermal reduction of aluminum chloride by Mn.

88. HANNAH, R.C. et alii: Design factors in aluminum reduction technology. Proc. R. Aust. Chem. Inst., Vol. 43. No. 8. 1976. pp. 239-243.

Fundamental features of Al production by the Hall-Heroult and Alcoa electrolytic procesees are reviewed. Likely future trends in the smelting process are examined.

89. JEFFES, J.H.E.; VASANTASREE, V.: Second progress report on recent advancee in extraction metallurgy--pyrometallurgy. International Metallurgical Reviews, Vol. 21. Sept. 1976. pp. 128-14.

Physico-chemical data relevant to pyrometallurgy are reviewed and experimental techniques described. The eignificance of pollution and

of fuel costs is discussed with particular reference to the Cu and Al industries.

90. Metal recovery process. Neo-Pro Corp. No. 3,942,976 /28 June 1973/. Official Gazette, 9 Mar. 1976. /U.S. patent/

A process for recovering the metal content of metal containing ores selected from the group consisting of sulfide and oxide ores and mixtures and concentrates thereof comprises igniting an intimately admixed mass consisting essentially of the ore and metallic Al to cause the metal content to be converted to metallic form, sintering the ignited mass at 1000° to 1500°C to form a coherent, porous and easily pulverizable mass containing the metal content of the ore in metallic form, and subsequently separating and recovering the metal content therefrom.

91. Method for the production of aluminum. Applied Aluminum Research Corp. No. 3,918,960 /21 July 1972; new application of No. 3,615,359, 20 Dec. 1967/. Official Gazette, 11 Nov. 1975. /U.S. patent/

A process for the continuous production of Al compriees the steps of: introducing gaseous aluminum trichloride at a bottom portion of a reaction chamber.

92. Method of producing aluminum fluoride. Elkem-Spiger Verket. No. 3,996,340; No. 1449,837 /12 Dec. 1972/. Official Gazette, 7 Dec. 1976. /U.S., British patents/

93. ONO, K.; MORIYAMA, J.: Low-pressure, direct arc, carbothermic reduction of alumina. Pt. 1. Aluminium, Vol. 52. No. 7. 1976. pp. 424-429.

When the d.c. arc is operated between two consumable Al_2O_3-C mixture electrodes under a low pressure due to continuous evacuation, the reduction proceeds rapidly at the electrode surfaces because of the high temperature, above 3000°C, and the reduced pressure. The reduction products, comprising an Al and CO gas mixture, flow through the electrode gap and are exhausted into the vacuum chamber, maintained below 5 mm Hg, at a supersonic velocity, and then quenched. The Al component of the gas mixture is deposited over the chamber wall as a layer of fine powder, while the CO is swept away to the pumping system.

94. ONO, K.; MORIYAMA, J.: Low pressure, direct arc, carbothermic reduction of alumina. Pt. 2. Aluminium, Vol. 52. No. 8. 1976. pp. 509-513.

In the low-pressure, direct-arc, carbothermic reduction of alumina, a d.c. arc operates between two consumable electrodes, consisting of an alumina and C mixture, under reduced pressure created by continuous evacuation. Since the arc temperature exceeds the boiling point of Al, the reduced Al forms a gaseous mixture with CO.

95. ONO, K.; MORIYAMA, J.: Low-pressure, direct-arc, carbothermic reduction of alumina. Pt. 3. Aluminium, Vol. 52. No. 9. 1976. pp. 550-556.

Among the possible pictures of the Al smelting reaction, the direct reduction of Al_2O_3 by C is thought to be the most simple. The low--pressure, direct-arc, carbothermic reduction of Al_2O_3 is based on the reaction to give directly a gaseous mixture of Al and CO.

96. OSTANIN, Yu.D. et alii: Investigation of the intermediate compounds formed in the carbothermic reduction of kyanite concentrates. Trudy VAMI, No. 89. 1974. pp. 79-85. /Russian/

A study was made on the characteristics of intermediate compounds formed during reduction of a kyanite concentration by the carbothermic method. Briquettes made of kyanite concentrate and C were heated in a furnace at 2200°C and macrostructures of different sections were studied.

97. Process for the production of finely powdered aluminum trichloride of uniform particle size, Societa Italiana Resine SpA. No. 3,878,293 /13 June 1972/. Official Gazette, 15 Apr. 1975. /U.S. patent/

Process for the production of finely powdered aluminum trichloride of uniform particle size of at most about 1 micron and having a bulk density of 0.35 to 0.55 kg/cu dm from aluminum trichloride vapor.

98. Production of aluminum trichloride and magnesium oxide. No. 3,939,247 /27 Aug. 1973/. Official Gazette, 17 Feb. 1976. /U.S. patent/

A method of producing aluminum trichloride and magnesium oxide comprises reacting alumina or alumina-containing material which reacts with magnesium chloride in accordance with the chemical equation $Al_2O_3 + 3MgCl_2$ 3 MgO + $2AlCl_3$ wherein the reaction is carried out at a temperature in the range from above about the melting point of magnesium chloride to 2000°C in the presence of a continually mixed mass of inert solid particulate material and wherein the resulting produced $AlCl_3$ is recovered as a vapor from the resulting produced solid MgO.

99. Recovery of metallic aluminum and silicon by fusion melting. No. 2420,595 /27 Apr. 1974/. /German patent/

The source of C used to reduce the charge material to the metallic state is material such as bituminous shale, coal waste, ballast coal, candle ash, etc. The raw materials are thoroughly mixed together by grinding, etc. to homogenize the mixture, the C content being present in a sufficient amount to reduce the oxide content. This mixture is then blended with a binder and pressed into briquets to form the charge for an electric reduction furnace in which it is converted into an alloy containing 20-50% Al, 40-70% Si and 10-20% Fe in a slag-free manner.

100. SHELTON, R.A.J.: Seoond progress report on recent advances in extraction metallurgy. Pt. D. Chloride Process Metallurgy. International Metallurgical Reviews, Vol. 21. Sept. 1976. pp. 141-147.

Steps in the Toth process of Al production from bauxite, clays, etc. are set out in detail. The sequence-calcining, chlorination /mixed with coke/, $AlCl_3$ purification and Mn reaction -- corresponds to over--all carbothermic reduction. Economy and elimination of Hall-process pollution are claimed. The chemistry is generally taken as feasible. The energy savings claimed are large.

101. Silicoaluminum production. Dneprovsk Kirov Aluminium Works, No. 2244,899 /17 Sept. 1971/. /German patent/

Briquets for manufacture of silico Al in arc furnaces by fusion reduction of ores, contain in wt %, 30-40% C reductant, 4-20% alumina, 8-20% kaolin, balance disthene sillimanite containing 10-21 wt % disthene. The raw materials are mixed together with a sulfite-alcohol lye to produce a moisture content of 14-16% and briqueted in a roll briqueting machine before drying in a gas fired belt dryer at 200° to 230°C to a moisture content of 1%.

102. WALDE, H.: Electrothermal winning and reprocessing of an aluminum--silicon-iron alloy. Chemie-Ingenieur-Technik, Vol. 48. No. 2. 1976. pp. 143-144. /German/

Wastes from mining of low-grade coal are smelted in an electric furnace to give an intermediate alloy containing Al 24-40, Si 38-52, Fe 14-20, C 0.2-2, Ti 0.5-2, Ca 1-5%. The Al is extracted as an amalgam, the Si is recovered by leaching with acid and the Fe-containing product is converted to a low-C steel.

103. ZAGUDAEV, A.M. et alii: Production of aluminum fluoride from fluoro-silicic acid and aluminum hydroxide. Himičeskaja Promyslennost, No. 7. 1976. pp. 521-524. /Russian/

A 12% solution of H_2SiF_6 is treated with $Al/OH/_3$ at 90° to 95°C. Use of lower concentration of the acid makes centrifugal or vacuum filtration more difficult. A 3-5% excess of acid is required for the reaction. Reaction time is 10-15 min. Under these conditions $Al/OH/_3$ is dissolved almost completely and the removal of SiO_2 by filtration practicable. After cooling the filtrate, AlF_3 is crystallized, removed with a cylindrical vacuum filter, dried at 100°C and most of the crystalline H_2O evaporated at 180° to 200°C. The AlF_3 is calcined in a rotary furnace heated by burning natural gas.

104. ZVIADADZE, G.N. et alii: Attaining the maximum rate of lanthanum and cerium chloride reduction during the vacuum thermic process for production of aluminum-lanthanum and aluminum-cerium alloys. Soobščenija Akademii Nauk Gruzinskoj SSR, Vol. 77. No. 2. 1975. pp. 393-396. /Russian/

Statistical kinetic data from aluminothermic reduction in vacuum of $LaCl_3$ and $CeCl_3$, when analyzed using an optimazation technique, predicted maximum reduction of $LaCl_3$ at 925 C, molar ratio $Al:LaCl_3$ = = 13.34 and process time of 33 min. An actual experiment gave 98%. The optimum parameters for $CeCl_3$ were 900 C, $Al:CeCl_3$ = 12.78 and 26 min. An actual experiment gave 96% reduction.

3. PRODUCTION OF SUPER-PURITY ALUMINIUM

105. Aluminium and aluminium alloys. Very pure aluminium by electrolytic refining, In: KIRK-OTHMER: Encyclopedia of chemical technology. Vol. 1. New York - London, 1963. Intersc. Publ., pp. 946-947.

The principle of electrolytic refining. Electrolytic refining in three layers. The Péchiney Company perfected a three-layer refining process which is very successful industrially.

106. DIMITROV, Q.: High-purity metals. Science, Progrés, Découverte, No. 3424, Nov. 1970. pp. 10-19.

Metallurgical chemistry research work towards producing very high-purity metals resulted in reaching entirely new metal properties. The most remarkable among them concern conductivity, magnetism, mechanical characteristics and recrystallization phenomena.

107. Electrolitic production of aluminium. Nippon Light Metal. Japanese J7 6038,642 /29 Dec. 1970/

The process comprises obtaining a density of CaF_2 in the Al electrolyte bath by using the detected intensity of CaK X-ray fluorescence, which is obtained by performing an X-ray fluorescence analysis on a sample of the Li containing Al electrolyte bath, measuring the X-ray diffraction os Na, Li, aluminium fluoride, LiF, NaF, CaF_2 and alpha--alumina by X-ray diffraction analysis, obtaining NaF/AlF_3 ratio /C.R./ from the detected X-ray diffraction intensity of Na, Li, aluminium fluoride, obtaining the density of LiF from the detected X-ray diffraction intensity of LiF, Na, Li, aluminium fluoride and from the obtained CaF_2 density and adjusting the density of LiF and a NaF/AlF_3 ratio in the bath to the desired range.

108. HANNIBAL, W.D. et alii: High-purity aluminium. Production, processing and properties. Metall, Vol. 27. No. 3. 1973. pp. 203-211. /German/

Due to a many years lasting development research activity it is at last feasible to produce high-purity aluminum in different qualities and technical quantities as a semi-product. For that purpose electrolytic refining is applied, utilizing aluminium-organic electrolytes, horizontal zone-smelting purification, as well as the combination of these processes.

109. ORMAN, M. et alii: Modifications in the substructure of 99,99 aluminium foils during their production. Praoe. Institut des Métaux Non-Perreux, TIV. No. 1. 1975. p. 5.

Jugost were produoed on a 400 x 1050 x 2000 mm roll; hot lamination gave 10 mm wide strips; cold lamination resulted in 0,5 mm etrips; then followed the lamination of foils to 80 micrometa; the re-crystallization of the foils; the stripping with regard to the foil surfaoe received; oxidation of the foils to form a dielectric layer.

110. Production of high-purity aluminium by electrolyeis. Part IV. In: FULDA, W.; GINSBERG, H.: Bauxite and aluminium. Part II. Aluminium. Berlin, 1953. Walter de Gruyter and Co., on pp. 97-120. /Book in German/

Development of eleotrolytio refining with liquid anode and cathode; refining with solid anode and eolide cathode and also with eolid anode and liquid cathode; refining of aluminium-scrap by three-stage electrolysis; abstraction of magnesium; compoeition and charaoteristios of a refining oell; eeparation of rich heavy metal-containing melts; thermal balanoe of a refining oell; struoture and operation of an electrolysis plant.

4. THE PRIMARY ALUMINIUM SMELTER INDUSTRY OF THE WORLD

111. Aluminium in Canada. Revue de l'Aluminium, No. 452. Jun. 1976. pp. 284-285. /French/

ALCAN foresees a long-term rise of its electrolysis capacity at Quebec by 45% up to the year 2005:
- by establishing at Port Alfred /about 16 km south from Arvida/ an electrolysis plant of 181 000 tons yearly, in three stages;
- by modernising the four electrolysis plants at Quebec to an expanded capacity of 91 000 tons per year.

112. Aluminium in Guyana and Indonesia. Revue de l'Aluminium, No. 449, Mar. 1976. pp. 115-117. /French/

The company GUYBAU has agreed to deliver to China 30 000 metric tons of alumina in 1976 and to continue to supply 50 000 tons yearly during 1977 to 1979. - The president of Sumitomo Chemical and Nippon Asahan Aluminium estimates the value of energy to be supplied by the electrolysis plant at Asahan to 4-5 millions.

113. Aluminium in Norway and Yugoslavia. Revue de l'Aluminium, No. 447. Jan. 1976. pp. 11-12. /French/

The Norwegian aluminium-producers are disposing of an electrolysis capacity of about 700 000 tons per year, while their transformation capacity is only 100 000 tons yearly. -- The aluminium plant at Titograd has operated under such heavy conditions in the last half year of 1975 that their loss suffered amounts to about 60 millions of dinars.

114. Aluminium in Spain and Guyana. Revue de l'Aluminium, No. 454. Aug/Sept. 1976. pp. 393-395. /French/

The Spanish company ENDASA foresees an improvement for 1976 and intends to produce 138 000 tons of primary raw aluminium, 55 000 tons of laminated goods, 26 500 tons of wire and 13 000 tons of foil. The bauxite of Guyana is being exploited by two state-owned companies: Guyana Bauxite Co. /formerly Demerara Bauxite Co nationalized in 1971/ and Berbive Mining Co. /formerly Reynolds Guyana Mines/.

115. Aluminium in the United Kingdom. Revue de l'Aluminium, No. 456. Nov. 1976. pp. 505-507. /French/

Alcan Aluminium Ltd. is in the position to expand the production of its electrolysis plant at Lynemouth from 120 000 tons to about 170 000 tons per year within the period of four years. -- British Aluminium will invest 3 million £ to modernize its rolling mill at Falkirk, Stirlingshire. -- Alcoa has announced its intention to modernize its cold rolling plant for aluminium strips at Waunarlwydd near Swansea.

116. Aluminium in the United States. Revue de l'Aluminium, No. 452. Jun. 1976. pp. 284-285. /French/

Anaconda will resume the operation of a part of the installation for the moment at standstill in its plant at Columbia Falls, Montana, by which the percentage of its electrolysis capacity will rise from 71 to 79%.

117. Aluminium-refining in Europe, Japan and the United States. OEA, May 1976. 31 p.

The report comments on the developments of the aluminium-refining industry in the United States, Europe and Japan for the period of 1975/1976.

118. BALTENSPERGER, K.: Selection and operation of a reduction process for a developing country in the Middle East. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 57-72.

Aluminium Bahrain was founded in 1968 as an independent company to produce Al on the island of Bahrain in the Arabian Gulf. The smelter was designed for an annual capacity of 120,000 metric tons of Al. When selecting the process the special conditions of the area had to be taken into account, namely cheap energy availability, tropical desert climate, remoteness from major industrial supply countries and labor availability. A 105 KA prebake, low current density cell for side breaking was selected.

119. BAUDART, G.A.: Reflexions on a change. Revue de l'Aluminium, No. 438. Mar. 1975. pp. 121-123. /French/

The centre of gravity of aluminium world production, which prior to the last war was located in Europe, passed to North America during the hostilities and has remained there. Over the last thirty years, the share of Eastern Block countries in the aggregate figure has more than doubled and it can be expected that with the developments announced by the USSR, this relative share will increase yet further.

120. CHABANNES, L.: A quick look at the 10 years period covering 1970/1980. Revue de l'Aluminium, No. 451. May 1976. pp. 209-210. /French/

Between 1970 and 1974, Western World primary aluminium production capacity had increased by 3,100,000 t /7.5%/year/, 2,300,000 t of which resulted from new plants. Between 1974 and 1978 production capacity increase will be only 3.5%/year of which only 600,000 t will result from new plants, i.e. 34% of the overall capacity increase /1,800,000 t/.

121. FISCHER, P.U.: Prospects of establishing aluminium electrolysis plants in the Persian Gulf region. Metals Bulletin Monthly, Dec. 1975 /60/, pp. 26-29.

122. GUINARD, C.: Aluminium in Ghana. Revue de l'Aluminium, No. 439. Apr. 1975. pp. 178-181. /French/

The corporation La Valco /90% Kaiser, 10% Reynolds/, which is running at Tema an electrolysis plant with 154,000 metric tons per year capacity, plans to increase its capacity by 46,000 metric tons per year in 1976.

123. GUINARD, C.: Aluminium in Sweden. Revue de l'Aluminium, No. 439. Apr. 1975. pp. 178-181. /French/

The Grönges Aluminium company has given up its project for establishing a plant of 100,000 metric tons of aluminium capacity at Jokkmokk, which should have started partly in 1977; however, the capacity of its electrolysis plant at Sundwall will be expanded from 86,000 tons to 135,000 metric tons per year.

124. IPA figures. Mining Journal, Vol. 287. No. 7358. 27.Aug. 1976. p. 158.

Members of the International Primary Aluminium Institute produced 839,000 tons primary aluminium last month, compared with 802,000 tons in June.

125. KERN, M.: IPAI, the international primary institute. Revue de l'Aluminium, No. 441. Jun. 1975. p. 284. /French/

It groups some 50 companies covering roughly 130 primary aluminium smelters and representing, due to this fact, nearly the whole Western World industry.

126. KOVÁCS, P.: Aluminium industry in Japan. Revue de l'Aluminium, No. 445. Nov. 1975. pp. 481-483. /French/

The company Mitsui Aluminium decided to double the electrolysis capacity of its plant at Miike /in 1976 about 160,000 tons yearly/, since in the preceding year Mitsui Alumina has continued to expand

the capacity of its alumina plant at Wakamatsu /Omuta/ from 200,000 tons to 400,000 tons per year by March 1976. The expenditure on new installations amounts to 10.7 milliards yen /about 158 million French Francs/.

127. MISSONIER, H.: Trend. United States: excitements from "cold waves". Revue de l'Aluminium, No. 459. Feb. 1977. pp. 66-68. /French/

The aluminium industry profited from the upward trend of the economy in 1976. The market proportion of the electrolysis plants representing 76% in January, have attained 83% in June and 90.5% in December 1976.

128. MISSONIER, H.: Trend of primary raw aluminium in the Western World in the first quarter of 1976. Revue de l'Aluminium, No. 451. May 1976. pp. 219-220. /French/

The improvement observed regarding the situation of the industry in the second half of 1975 were confirmed during the first quarter of 1976.

129. MISSONIER, H.: Trends based on statistical data of IPAI for the 4th quarter of 1975: the decrease of stocks has started. Revue de l'Aluminium, No. 447. Jan. 1976. pp. 7-9. /French/

In the second half of 1975 the resumption of primary, raw aluminium deliveries - which begun already in the second quarter of 1975 - has continued and becamme more rapid, partly due to the deliveries to the People's Republic of China and partly also to purchases - mostly of technical character - of the aluminium processing industries.

130. MISSONIER, H.: Trends based on statistical data of IPAI in the 3rd quarter 1976. Revue de l'Aluminium, No. 457. Dec. 1976. pp. 553-555. /French/

During the third quarter of 1976 the consumption of raw, primary aluminium reached 2,788,000 tons, which represents an increase of 25% as against 1975. The demand in aluminium - in the same period - has not changed considerably, which can be explained by the economic stagnation in Japan.

131. MW Industrial Gas Turbine Station supplies Bahrain aluminium smelter. Electrical Times, No. 4392. 2o-27. Aug. 1976. pp. 12-13.

The Alba smelter /producing over 120,000 tons/year Al/ is powered by 19 gas turbines totaling 300 MW at 26.6 C, designed by General Electric /U.S./ and made by John Brown Engineering. Gas turbines were chosen because of gas availability, low capital cost and short delivery and commissioning times. Thermal efficiency was not a factor, because of the extremely low gas cost. Distillate fuel can be burned if the gas

supply fails. Tables give station statistics and show the effect of temperature on operation. Average availability is 95%, average load/ /turbine 13,7 MW, thermal efficiency 21% and unplanned outages are less than 0,1%. The turbines drive closed-air-circuit water-cooled brushless a.c. generators manufactured by Brush Electrical Machines. /Based on a paper: "600,000 hr operation at the world's largest industrial gas turbine power station", Robert Coats and John Little, to a G.E. Gas Turbine Congress, Dubrovnik, Yugoslavia, earlier in 1976./

132. MICHEL, J.: Alcan - the second biggest aluminium-producer of the world. Revue de l'Aluminium, No. 461. Apr. 1977. pp. 161-166. /French/

Alcan has built-up half of its present aluminium production in Canada during the last 50 years; Canada's electrolytic production capacity has doubled in the last 20 years. Hence, Alcan has met its international vocation by expanding the transformation of alumina and aluminium for its own demands.

133. OUELLET, M.G.: Process control computer systems — How does Alcan make them work? Canadian Mining and Metallurgical Bulletin, Vol. 69. No. 766. Feb. 1976. pp. 53-55.

Alcan has been involved in process control computer systems since 1964. During this ten-year period, they have applied this "magic" tool to various processes embodied in the production of Al: electrolysis, ore digestion, anode batching systems and quality control. The various approaches Alcan used to insure that all these on-line process control real-time applications reach their objectives are outlined.

134. PACKARD, R.: The Metal Bulletin Handbook 1975. Metal Bulletin, London, May 1976. 8th ed. 927 p.

The tables included in the Handbook render world-wide and country-wise data on production, export and import of bauxite, aluminum, primary aluminium, semi-products, castings and secondary aluminium in metric tons for the periods of 1971, 1972, 1973 and January to September 1974.

135. Primary aluminium in Japan. Revue de l'Aluminium, No. 457. Dec. 1976. pp. 551-552. /French/

Mitsui Aluminium intends to install 128 calcined anode cells /electrolyzers/ at 136,000 amperes. - Sumitomo Light Metal Co. will start the operation of its electrolysis plant at Sakata in January 1977.

136. Primary aluminium in the United States. Revue de l'Aluminium, No. 448. Feb. 1976. pp. 58-60. /French/

The Aluminium Association decided to transfer its headquarters from New York to Washington. The regroupment of the 12 American primary

aluminium producers - as members of the Association - represents 85% of the aluminium semi-finished product deliveries in the United States.

137. REID, I.W.: NZAS Bluff smelter. Met. Aust., Vol. 8. No. 10. 1976. pp. 241-242.

When Comalco and the New Zealand Government had agreed on rights to large blocks of hydroelectric power from Lake Manapeuri, Bluff, with a deep-water port and close to an established community, was an obvious choice of site. Present production is 150,000 tons/year, using Al_2O_3 refined at Gladstone, Queensland, from Weipa bauxite. Prebake reduction cells operating at 150,000 A each produce about 1 ton/day; there are 408 cells. Current efficiency is 86-90%. Aluminum tapped into 5 tons crucibles is taken by modified forklift truck to the Metal Products building and held in oil-fired furnaces pending analysis and alloying where desired. Products are sow, unalloyed and extrusion ingot, rolling block, EC-grade redraw rod and alloyed foundry ingot; each is summarised. Vertical direct chill is used for extrusion billet and rolling block, continuous horizontal DC for foundry ingot. The plant is shown.

138. World situation in primary aluminium. Revue de l'Aluminium, No. 448. Feb. 1976. pp. 58-60. /French/

According to statistical data published by IPAI, the primary aluminium-producers of the world /members of IPAI/ kept a stock of 122,000 tons of raw aluminium in November 1975, representing 15.6% of their monthly production.

5. SPECIFICS OF EQUIPMENT IN THE PRIMARY ALUMINIUM PRODUCTION

139. Aluminum electrolysis cathode block with embedded bondless busbar and raised edges for hearth rim. Elettrocarbonium. No. 2529,215 /17 July 1974/. /German patent/

A cathode of electrolytic cells, used for Al production by electrolysis of fused Al salts, is a block of C, graphite and/or semigraphite in which a metallic cathodic busbar has been embedded. The cathode blocks which surround the bus bars and form an integral unit with them have raised edges to form a rim for the cell hearth.

140. Aluminum electrolysis furnace. Giulini GmbH. No. 3,960,696 /18 June 1976/. Official Gazette, 1 June 1976. /U.S. patent/

In an Al electrolysis furnace arranged to be filled with a mass of electrolyte and having a plurality of anodes, each presenting a surface through which current flows and a cathode presenting a surface through which current flows, which faces the anode surfaces, and which is located to underlie the region to be occupied by the electrolyte, with at least part of the cathode surface being coextensive with the anode surfaces.

141. Aluminium electrolyzer anode bolt extractor and replacement apparatus for consumable anodes. Vni Institute Aljuminievoi. No. 2226,477 /20 Apr. 1973/. /French patent/

Anode bolt extraction and replacement apparatus for Al electrolyzers with a top current supply is of the type comprising a cross-bar mounted on the lifting carriage of a traveling crane and fitted with a hollow bolt extractor bar which moves in station and in translation carrying a pincer constituted by a socket with holding clamps fixed to a suspension moving inside the socket and attached to a fastener which holds the clamps in their upper position.

142. Aluminum electrolyzer cathode casing. Bratsk Aluminium Works, No. 483,456 /29 Oct. 1973/. /Soviet patent/

The cathode casing of Al electrolyzer is designed in the form of rectangular box with the longitudinal sides resting on the buttress beam provided with cross-bar members. To insure uniform compression of electrolyzer bottom, one end of the cross-bar members is fixed with a regulating mechanism consisting of hydraulic jacks with supports and stops.

143. Aluminum electrolyzer ladle lid system -- Center lid boss grooved for coupling with lock-wedge controlling tie linkage. Bratsk Aluminium Works, No. 435,303 /27 Apr. 1973/. /Soviet patent/

Vacuum ladle for Al removal from electrolyzers consists of a container with lid and suction tube, crossbar and lid wedges and a system for rotating the ladles as required. By fitting the lid with a cylindrical boss and providing a groove along this for the wedges and a system of levers and a coupling, the entire lid operation can be mechanized and a considerable amount of time and unattractive work eliminated.

144. Aluminum electrolyzer side lining. Aluminium Magnesium Elect. Ind. Re. Inst. No. 441,353 /12 June 1973/. /Soviet patent/

The side surface of blocks facing the anode is covered with magnesite bricks over the C containing blocks and this protects the latter for a period of 2-3 months. This method also accelerates the formation of cryolite-alumina coatings, which protect the lining. The magnesium oxide, which is the main component of magnesite bricks, passes gradually into the melt, and this is equivalent to adding MgO powder.

145. Aluminum potline shield. Copperloy Corp. No. 3,948,749 /2 Apr. 1975/. Official Gazette, 6 Apr. 1976. /U.S. patent/

A curved shield device for use in covering side openings in Al reduction potlines comprises a series of planar prerolled extrusion members longitudinally joined together, a base member disposed along the bottom edge of the extrusion member and an insulated lip member disposed along the top edge of extrusion members.

146. ANHUTH,F.: Need for improvements in the installation of aluminum reduction cells. In: "Refractories in Nonferrous Metallurgy", Zellerfeld, Germany, No. 29. 1975. GDMB, pp. 175-181. /German/

The construction of Al reduction cell is described and operating problems associated with the C lining and cathode are discussed. The composition of the melt is constantly changing and any local irregularities in the lining may lead to uneven current distributions and local overheating temperature gradients in the cathode.

147. Apparatus for making shaped bodies. Vereinigte Aluminium Werke AG. No. 3,824,060 /12 Jan. 1973/. Official Gazette, 16 July 1974. /U.S. patent/

An apparatus for producing coherent shaped bodies from granular material is described. The granular material is confined in a mold and the mold is subjected to vibratory motions requisite for compacting the granular material. In accordance with the invention the frequency of the vibratory motions is continuously varied.

148. Automatic feed block molding prees for granular materials. Von Roll AG. No. 3,887,685; No. 382,786 /3 Aug. 1972/ Official Gazette, 3 Juns 1975. /U.S.; Britieh patente/

A block molding prees particularly suited for forming block electrodes by compression of granulated material mixed with a bindsr comprises, in combination with a press frame mold means open above and below; an upper and a lower compression means fitting the mold meane, reepectively, from above and below.

149. LeCARDINAL, Ph.: Hooding of Soderberg pots in the St.Jean de Maurienne plant. In: "Light Metals 1976". Vol. 2. New York, 1976. Metallurgical Society AIME, pp. 527-541.

The 156 vertical stud pots at a French Al plant have been completely hooded to collect all fumee and reduce F emissions. The skirts and burnere were left under their original hoods and a secondary eyetem covering the peripheral part of the pot was mounted between the casing and potshell. A hood fume exhaust system collects fumee which have escaped from the skirt and burner hoods.

150. Cells for manufacturing aluminum by electrolysis. Soc. Electrodes refractaires Savoie. No. 2251,629 /20 Nov. 1973/. /French patent/

A cathodic lining element for celle used for manufacturing Al by electrolysis, where the element consists of a precalcined C block containing at leaet one metal bar for carrying ths electric current and placed in a longitudinal recese in the block. The novelty ie that the gap between the metal bar and the walle of the recess is filled with a carbonaceous powder rammed to a minimum apparent density of 1.4.

151. Centralized control system for electrolyzers provided with detectors of anodic effect, etorage cells and recorder. Cvetmetavtomatika, No. 475,418 /27 July 1973/. /Soviet patent/

Automatic control of potential of anode effect in electrolyzers used in production of Al, consists of parallel circuits each of which regieters anode effect of an electrolyzer. The circuit includes threshold relay which operatee from anode effect exceeding 10 V.

152. CLAY, J. et alii: Multivariable control of bath recovery plant for aluminum electrolysis. Measurement and Control, Vol. 9. No. 2. 1976. pp. 61-64.

Careful examination of plant physical realitiee shows how a time--varying, nonlinear, sampled-data, multivariable control problem can be reduced to an easily manageable adaptive, time-invariant, linear one. It was demonstrated how thie computerization leads to maximum production and minimum coets in the operation of the bath recovery plant for the Hall-Herould Al smelting procese.

153. Compressed air in the production of aluminum. Air Comprimé, No. 3. 1976. pp. 14-15. /French/

The role played by compressed air in the production of Al by igneous electrolysis is described. The chipping hammers mounted on traveling cranes to break up the crust on the cells are actuated by compressed air as are the ejectors which remove the metal accumulated in the cathode area by producing a partial vacuum. The traveling cranes must stand up to very severe conditions which are described. They are supplied to all units of the Pechiney Group by the Soc. Electrique-Charpente-Levage. The cranes were designed by collaboration of Atlas Copco and PUK at the Riouperoux /Isere/ works.

154. Cover for electrolysis plant. Volgograd Aljuminie, No. 2237,992 /15 June 1973/. /French patent/

The cover includes a horizontal top part and end walls. Slooping side. walls are located on a frame pivoted to the plant frame and a drive is provided for each frame to lift it. In Al refining plant this enables combustible electrodes to be charged and the electrolyte to beztreated when the sidewalls are raised.

155. Covering of an aluminum-producing electrolysis cell. No. 3,935,090 /15 Mar. 1974/. Official Gazette, 27 Jan. 1976. /U.S. patent/

An Al-producing electrolysis cell having vertical side walls and provided with holders for block-type preburnt anodes, comprises: a hood for gathering and extracting volatiles, located above the cell and having side walls whose edges are parallel to the cell side walls.

156. DRUKAREV, V.A.: Balance of anode material in various types of electrolytic cells. Trudy Vsesojuznogo Naucno-Issledovatelnogo Proektnogo Instituta Aljumino-Magnievoj Elektr. Promyslennosti, Vol. 86. 1973. pp. 53-59. /Russian/

A comparative balance was made of the anodic material in various types of cells for Al production. Some technical economic and technological indices were presented of three types of electrolytic cells, namely; with upper current feed, with sintered anodes and with a side current feed.

157. Electric furnace for aluminum-silicon alloys production. Aluminium, Magnesium, Elect. Ind. Re. Inst. No. 473,042 /2 June 1972/. /Soviet patent/

To reduce electric energy losses when current is passed through the charge and to improve the technical/economical parameters of the reducing melting, the bath is provided with vertical nonconducting baffles situated between adjacent electrodes.

158. Electrolytic aluminum furnaces control. Vereinigte Aluminium Werke AG. No. 2337,797 /25 July 1973/. /German patent/

An electrolytic Al furnace is controlled by a computer which adjusts the electrode distance from the furnace resistance. The desired value of the resistance is varied as a function of the current yield, the optimum of which is assessed by the number of voltage peaks exceeding a given value.

159. Electrolytic cell alumina feeder. No. 457,752 /25 June 1973/. /Soviet patent/

The alumina poured over the electrolyte crust between the side of the bath and the inclined wall of gas collecting bell is heated most at the side close to the bell. Lift of the latter provides a gap for the movement of alumina under the bell, and the surface of the electrolyte then receives a batch of alumina.

160. Electrolytic cell line for aluminum production. Nippon Light Metal, No. J5 1123,717 /22 Apr. 1975/. /Japanese patent/

Electrolytic cells are arranged side by side along electrolytic cell lines; a rectifier is provided for supplying a d.c. current to each cell through a conductor; conductors are laid along both shorter sides of each cell; a compensating conductor is laid outside an intercell conductor, along the shorter side.

161. Electrolytic cell for aluminum production having high volume of anode surface in hollow cathode space. Comalco Ltd. No. 1454,869 /20 Dec. 1973/. /British patent/

Electrolytic cell for the production of Al has a rectangular cavity with the anodes arranged parallel to the longer and shorter sides of the cavity, alumina and other bath additives being fed into the central region of the bath, the total cross-sectional area of the anodes being over 85% of the cross-sectional area of the cavity.

162. Electrolyzer alumina automatic feeding -- Small batches supplied at regular intervals stabilize electrolyte composition and temperature. Dneprovsk Aluminium Plant, No. 458,624 /25 Jan. 1965/. /Soviet patent/

The batches of 1-3 kg are metered from stationary feeders into holes pierced in the electrolyte crust and left over the hole for 2-6 min to insure preheating. This achieves an almost continuous delivery of alumina into the cell with subsequent complete dissolution without sediments and with a minimum allowed tension in the electrolyzer.

163. Electrolyzers continuous charging device. Irkutsk Aluminium Works, No. 461,152 /2 Aug. 1972/. /Soviet patent/

Charging device for Al electrolyzers consists of an internally divided pipe which is fitted in the upper reaches with a series of inclined baffles. The lower end of the pipe forms a bell mouth and is partitioned by means of a fan array of guide ribs. This insures continuous charging of Al_2O_3 to the facility. This provides a steady but modest flow of Al_2O_3 which insures complete dissolving within the electrolyzer. There is no chance of crust or skull forming on the surfaces of the plant, and this is turn cuts down the frequency of anode effects and servicing costs.

164. FORTUNATOV, N.S.: High-temperature gas pump for the sub-chloride preparation of aluminum. Himija i Technologija, No. 2. 1975. pp. 31-33. /Russian/

A pump with two-stage action: suction operably by Ar pressure and a liquid piston, operated by programmed electronics, is described. The operation of the two-chamber pump was regulated by gamma-ray sensors using a ^{137}Cs source, which had the best sensitivity for handling Al. The flow diagram of the circuitry is shown and the operating characteristics of the Ar pump in 0.6-1.4 atm range of pressure are tabulated.

165. GUZMAN, I.Ya. et alii: Influence of the preparation methods on durability of silicon nitride bonded silicon carbide bricks. Ogneupory, No. 7. July 1975. pp. 34-39. /Russian/

Nitride or oxynitride bonded SiC bricks, owing to their corrosion resistance, are used for linings of the sidewalls in Al electrolytic cells. Since it has been determined that durability of linings depends on the presence of free Si or SiO_2, experiments were conducted on various preparation methods of the bricks. The bricks were made by pressing or vibropressing SiC and Si powders, moistened by a sulfate binder. The green bricks were sintered at 1300° to 1500°C at different N pressures to effect the formation of a Si_3N_4 binder.

166. In an aluminum refinery -- a network of minicomputers improves the efficiency of the reduction cells. Automatique et Informatique Industrielles, No. 46. 1976. pp. 42-43. /French/

Automation of electrode positioning insuring minimal current consumption is achieved by the use of Nova 1200 minicomputers by Pata General, at the works of Intalco Aluminum Corp., Ferndale, Wash. /U.S./

167. JOFFE, A.Ya. et alii: Determination of an optimal cast iron composition for the sleeve-calcined anode contact used in aluminum electrolyzers. Cvetnye Metally, No. 9. Sep. 1975. pp. 36-39. /Russian/

A regression analysis was conducted on experimental trials of various cast irons for use as contact materials between the C anode block and metallic current conducting elements. The optimum composition of cast iron, based on a balance of casting properties and electrical conductivity, was as follows: 3.6-3.8% C, 114-1.6% Si, 0.3-0.5% Mn, 0.1% P, 0.05% S, balance Fe. It had a low electrical resistance, good fluidity and good crack resistance.

168. KALUZHSKII, N.A. et alii: Industrial testing of electrolytic cells with prebaked anodes at 260 kA. Cvetnye Metally, No. 2. Feb. 1976. pp. 40-43. /Russian/

In a pilot-production building three transversely placed cells with prebaked anodes have been operating successfully since 1972 at a current of 260 kA with an anode current density of 0.74 A sq cm. From Jan. 1974, to May 1975, with an average current of 262 kA, the productivity was 1785 kg/day, with a current efficiency of 84.5%, and 15,000 kw.hr/ton Al, with good sanitary engineering indices.

169. LAFITTE, J.: Anode transporters for the USSR. Serrurerie Constructions Métalliques, No.303. May 1976. pp. 64-65. /French/

This equipment, intended for the transport of the graphite anode blocks for the works, constructed with the technical assistance of Pechiney, at Regar in Tadjikistan, was manufactured in France by the Soc. Actime under subcontract to the Soc. Syprim. The Soviet factory will produce 500,000 tons/year Al, representing an annual consumption of 260,000 tons of anodes. The assembly of the transporter, which has a total weight of 500 tons, makes use of the following techniques: metallic construction, mechanical, electrical and pneumatic control mechanisms.

170. PÓCZE. J.: Collecting and processing data from the Aluminum electrolysis baths. Bányászati és Kohászati Lapok, Kohászat, Vol. 109. No. 6. 1976. pp. 282-287. /Hungarian/

The characteristic data of Al electrolysis baths are processed with a DATAMIK data collecting system. This new method assists the plant management by providing an objective control.

171. Press for carbon block electrodes, especially in aluminum smelting, is vibrated at top plate only, other parts being stationary. Ardal og Sunndal Verk, No. 2506,851 /20 Feb. 1974/. /German patent/

A press for making "green" C blocks for subsequent baking to make graphite electrodes, especially for Al smelting, comprises a mold with a fixed base, walls rigidly fixed to the base but in part

removable for extraction of the block and a weighted top preseing--plate sliding in vertical guides and covering the entire top of the block.

172. Remote controlled clamps for holding electrodes in electrolysis cells. No. 2618,214 /23 May 1975/. /German patent/

Apparatus for holding electrodes on the transverse carriers in electrolysis cells used for manufacturing Al comprises a clamp assembly for each electrode, the assembly being mounted on two brackets, one bracket being located on each side of each electrode; two clamping elements are located between the electrode shaft and a projection on each bracket, the elements being separated by a driving organ and a self-locking device which prevents the electrode from sliding downwards.

173. Ring furnace. Aluminum Co. of America, No. 3,975,149 /23 Apr. 1975/. Official Gazette, 17 Aug. 1976. /U.S. patent/

A ring furnace including pits bounded laterally by upright side wall flues connected in seriee by means for conducting gases from an outlet upper corner region of one flue to an inlet upper corner region of the next flue in the series, the outlet upper corner region of any given flue being opposite to its inlet upper corner region.

174. Sealing seams between carbon blocks in aluminum electrolysis cell. Aluminum Co. of America, No. 2509,550 /11 Mar. 1974/. /German patent/

Compoeition for sealing seams between C blocks forming the bottom of the Hall-Herould electrolysis cell for Al production comprises C aggregates and a binder /pitch/, is improved by using as a solvent at leaet one aromatic hydrocarbon having saturated side-chains and boiling between 150° and 350°C /preferably 200° to 300°C/.

175. SEMENOV, V.S.: Cyplakov, A.M.: Heat transfer at the electrolyte/ledge interface as a function of the main technological and geometric parameters of aluminum cells. Trudy VAMI, No. 89. 1974. pp. 19-23. /Russian/

The effects of anode geometry and current density on the heat transfer coefficient at the electrolyte-ledge interface in an Al cell were determined experimentally. The coefficient of heat transfer was measured by the coaxial cylinder method in eeveral industrial Al cells. Least-squares equations are given for the heat tranefer coefficient at the electrode/ledge interface in cells with prebaked and self-baking anodes.

176. SHISHKO, I.I.: Development and study of efficient systems for drying and dehydrating aluminum fluoride in a fluidized bed. Himija i Technologija /Kiev/, No.4. 1976. pp. 5-8. /Russian/

The construction of two semi-industrial furnaces, using a fast moving fluidized bed system, is described. They are built to dry and to calcine $AlF_2.3H_2O$ paste containing 25-30% H_2O plus 39.5% crystal H_2O. To prevent loss of F due to pyrolysis the paste advances at 20-25 cm/sec through nine sections of the furnace, reaching gradually and quickly the temperature of 560° to 600°C and in the last three sections it is cooled rapidly by a stream of air and leaves the furnace at room temperature.

177. Sound-damper for suction pump used in collecting vessel for aluminum--extraction. National Southwire Aluminum Co, No. 1421,402 /2 May 1973/. /British patent/

Muffler for the stream of air used to create a vacuum in an Al tapping crucible has inner and outer coaxial conduits, the inner conduit having an entrance opening and equally spaced elongated exit slots around the circumference. The slots extend over about one-half of the length of the conduit. The noise level is reduced from about 115 decibels to about 90 decibels.

178. Special tasks for lift trucks at alcan smelter. Foundry Trade Journal, Vol. 141. No. 3101. Dec. 1976. P. 1214.

At the Lynemouth 120,000 tons/year smelter anodes are produced at 2000/week. With rods attached these are 12 ft high. Each pot-line building has 88 pots, requring 22 anodes/pot. An anode /consumed within 23 days/ is replaced using a Hyster S70B lift truck with a crane arm and hook attached to the carriage.

179. TERENYI, G.: The use of refractory linings with silicon oxy-nitride binder in aluminum electrolysis baths. Bányászati és Kohászati Lapok, Kohászat, Vol. 108. No. 8. 1975. pp. 367-370. /Hungarian/

The rapid progress of technology and intensification of production has had a favorable influence on research in the field of refractories. A large number of new or unusual refractories has been developed, many of them for use in furnace in the Al industry, including Al electrolysis baths.

180. YEVSEYEV, A.P. et alii: Adoption of weight-metering feeders in the production of green mass. Cvetnye Metally, No. 6. June 1976. pp. 47-48. /Russian/

Automatic weight metering feeders for the automatic metering of green petroleum coke into the calcination kiln has allowed the feeding of coke to be stabilized, improving the quality of calcination.

The vibration electromagnetic feeder described consists of a chute combined with a vibratory drive.

181. ZHULIN, N.V. et alii: The failure of cast iron hoods during the electrolysis of aluminum. Cvetnye Metally, No, 11. Nov. 1975. pp. 37-38. /Russian/

The reasons for the failure of the gas-collection cast iron hood on Al electrolyzers with an upper current lead were studied. The primary reason for the corrosion is the formation of volatile carbonyl compounds of Fe and the flaking of the scale from the hood surface which is due to the harmful chemical corrosion of the metal by anode gases.

182. ZHULIN, N.V. et alii: Study of the composition of the refractory lining of dismantled aluminum electrolyzers. Cvetnye Metally, No. 11. Nov. 1976. pp. 29-31. /Russian/

Chemical, X-ray and petrographic analyses were conducted on refractory linings at ten different points of a dismantled Al electrolytic cell. Tabulated data are presented on the chemical composition /Na_2O, K_2O, Al_2O_3, SiO_2, etc/ at the ten points.

6. SOURCES AND SUPPLIES OF AUXILIARY MATERIALS IN THE PRIMARY ALUMINIUM PRODUCTION

183. BRANDTH, H.H.: Petroleum coke's role in oil refining. Kaiser Aluminum and Chemical Corp. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 333-349.

Petroleum coke is a byproduct from the refining of some crude oils and it has seen a phenomenal growth in volume in the past 20 years. Coking of heavy feed stocks in the refinery served the purpose of destroying residual oils and maximizing the production of light fractions such as gasoline and jet fuel.

184. Adhesive composition comprising coal-tar pitch and olefinic copolymers. U.S. Steel Corp. No. 3,882,066 /30 Apr. 1971/. Official Gazette, 6 May 1975. /U.S. patent/

A composition comprising between 20 and 50% of coal-tar pitch and 80 and 50% of a copolymer consisting essentially of ethylene and an ethylenically-unsaturated carboxylic acid containing from 3 to 8 C atoms, the resin having an acid content of between 0.1 and 75% by weight.

185. AVERINA, M.V.; NIKOLAEV, A.I.: Coke structure effect on the properties of carbonaceous materials. Cvetnye Metally, No. 1. 1976. pp. 46-48. /Russian/

Coke with mosaic, fine-grained structure gave the greatest mechanical strength. Acicular, striated structure resulted in the highest electric conductivity, as well as resistance to damage by temperature gradients and thermal shock. For the optimum combined electrical, mechanical and thermal properties coke needs an intermediate structure, such as KNPS, a special pyrolysis petroleum coke, with a disseminated spherulitic structure.

186. AVERINA, M.V.: Study of the effect of the structure of the petroleum coke-filler on the properties of carbon materials. Himija Tverdogo Topliva /Moscow/, No. 6. 1975. pp. 143-149. /Russian/

The effects of the supermolecular structure of low- and high--temperature petroleum cokes, their mixtures with each other and their mixtures with pyrolysis C black on the density, tensile modulus, X-ray characteristics, compressive strength and specific electrical resistance of composites prepared from them were determined.

187. BARANOVSKII, V.V.: A method for minimizing the parameters involved in preparing material balances for the calcination of petroleum coke. Trudy VAMI, No.92. 1975. pp. 5-8. /Russian/

Parameters used in making up material balances for calcination of petroleum coke at 1300° to 1350°C were minimized to simplify calculations. Equations are given for determining the rate of moisture removal and the production efficiency of the revolving furnace during calcining. Included in these equations are some 19 independent parameters.

188. BELITSKUS, D.: Effect of anthracite properties and formulation on properties of Bench scale cathode blocks. In: "Light Metals 1976". Vol.1. New York, 1976. AIME, pp. 411-432.

Bench-scale cathode blocks having an aggregate of 70% anthracite calcined at 1135°C--30% ball milled graphite and a coal tar pitch binder were fabricated, baked at 1135°C, and tested for electrical resistivity and expansion during electrolysis in a test cell. Twelve anthracite samples, for which a number of chemical and physical properties were determined, were used in cathode fabrication so that relationships among anthracite properties and cathode properties could be determined.

189. BHATIA, G.: Characteristics of extruded carbon mixes at high pressures of extrusion. Carbon, Vol. 14. No. 2. 1976. pp. 131-132. /French/

Mixes studied consisted of calcined petroleum coke as filler and coal tar pitch /R and B softening point 78°C/ as binder. Results tabulated show that mixes extruded at high speeds have higher apparent density, greater strength and lower electrical resistivity than those extruded at low speeds. Pressure makes the binder penetrate places where it could not in the mixing or molding operation.

190. CHALYKH, V.I.; KOROBOV, M.A.: Mechanism of foam formation during the electrochemical oxidation of a carbon anode. Cvetnye Metally, No. 11. 1975. pp. 35-37. /Russian/

The mechanism of foam formation is described as the consequence of the destruction of the bonds between the C of the binding agent and the filler by anode gases which filter into the porous anode and the O ions which diffuse into it. This mechanism describes the effect of many factors on the consumption of the C anode satisfactorily, including the anode current density, the composition of the dry charge, the porosity and gas permeability of the electrode, the effect of inhibitors, the packing of the anode with pyrolytic C, the thermal load on the anode, etc.

191. CHERNOV, R.V. et alii: Reaction of aluminum oxide with sodium hexafluorosilicate during sintering. Zurnal Prikladnoj Himii, Vol. 48. No. 3. 1975. pp. 634-635. /Russian/

Mixtures of Al_2O_3 with Na_2SiF_6 were fired at 500° and 600°C for 50 hr and at 700°C for 40 hr. The products were investigated by X-ray analysis. At first, chiolite was formed in the fluorination of Al_2O_3. Increase in temperature leads to the interaction of chiolite with SiO_2 to form albite and cryolite. At the starting ratio of Al_2O_3: :Na_2SiF_6 equals 1:3, cryolite is formed.

192. DEMIDOVA, A.I. et alii: Use of different petroleum pitches in the production of electrical carbon products. Himija Tverdogo Topliva /Moscow/, No.5. 1975. pp. 113-117. /Russian/

Pitches, obtained during the pyrolysis or cracking of petroleum, are good binders for electric C products. Pyrolysis and cracking pitches were compared with coal tar pitch in softening point, coke yield, group composition and wetting properties. Petroleum pyrolysis pitch was most suitable for use in electrical products with high stability characteristics.

193. FALK, E. et alii: The methodology for tars used in the fabrication of coal products. Metallurgia, Vol.28. No.10. 1976. pp. 521-528. /Rumanian/

Tar represents one of the basic raw materials used in the coal products industry. Different analysis methods are used to the effect of tar quality on the coal products. On the basis of a statistico-mathematical analysis it was concluded that for the current control of tar quality, 2-3 determinations are sufficient. The establishment of some mathematical relations between the characteristics of the solid phases, the technological fabrication parameters and the final product characteristics is proposed.

194. PARAGÓ, F.J.; SOOD, R.R.: Advances in rotary kiln calcination of petroleum coke. In: "Light Metals 1976". Vol.1. New York, 1976. AIME, pp. 351-362.

A process of coke calcination permits the realization of maximum production potentials in a kiln, independent of coke density requirements. Existing coke calcining kilns may be readily modified to take advantage of the "Low-to-Zero Fuel" calcining technology. For Al production requirements only, this potential fuel saving is equivalent to about 350 million cu ft of natural gas/month.

195. FITZER, E. et alii: Characterization of electrode coke graphitization by fine structure measurement. Berichte der Deutschen Keramischen Geeellschaft, Vol. 53. No. 6. 1976. pp. 169-174. /German/

The differentiation of high-graphitization grades of well-graphitized electrode coke by measurement of c direction lattice structure is insufficient. Evaluation of the diffraction profile half-width gives a better grouping of various grades of graphitization.

196. FITZER, E.; WEISENBURGER, S.: Evidence of catalytic effect of sulfur on graphitization between 1400° and 2000°C. Carbon, Vol. 14. No. 4. 1976. pp. 196-198. /French/

The effect of S content was studied, using petroleum coke, needle--like petroleum coke 1.7, 0.8, 0.4%, respectively. In situ X-ray diffraction measurements show that the irreversible contraction of interlayer distance starts during heating below 1500°C, indicating increased tendency to graphitization of the main part of the sample with increasing S.

197. GOETZE, B.; SCHARMANN, A.: Crystallite size distribution of polycrystalline carbon and graphite. Berichte der Deutschen Keramischen Gesellschaft, Vol. 53. No. 6. 1976. pp. 175-178. /German/

The crystallite size distribution of graphitized pitch coke was examined by studying the relations between density and crystallite size and between distributions of these properties. Crystallite eize was represented by X-ray data L_c. Density distribution was determined by the method of wetting fluids. High temperature treatment of pitch coke broadened the half-width of the distribution and shifted the maximum to larger L_c.

198. GOROKH, O.P. et alii: Effect of starting material on the fine structure of graphitized pitch cokee. Himija Tverdogo Topliva /Moscow/, No. 4. 1975. pp. 76-78. /Russian/

As the alpha-fraction /highly condensed fraction/ in the pitch feed roee, the crystal lattice defects /X-ray diffraction analyeie/ increased, thus impairing the graphitized pitch coke quality, and the crystal eize along the c axie generally decreased.

199. GUFELD, I.L.: Energy of activation of graphitization processes. Himija Tsverdogo Topliva, /Moscow/, No. 6. 1975. pp. 150-153. /Russian/

The energy of activation E of structural transformations in graphitization was calculated from kinetic equations not connected with any assumptions as to the relation of E or of the pre-exponential factor on the temperature and on the rate-controlling parameter. From experimental kinetics, E was thus calculated for pyrolytic C, petroleum coke and coal-tar pitch as a function of temperature and

graphitization degree. A spectrum of E was found, connected with the complexity of three-dimensional ordering processes in carbons.

200. HUTTINGER, K.J.; ROSENBLATT, U.: Kinetics of the graphitization-induced dimensional changes of artificial carbons.Carbon, Vol. 14. No. 5. 1976. pp. 267-270. /French/

Shrinkages of seven molded carbons /including pitch cokes and raw coke with thermoplastic binders and electrographites with thermosetting binders/ were measured perpendicular to the grain boundaries after 0.5-4 hr isothermal treatments at 1500° to 2900°C. Rates can be described by a general kinetic law. Total shrinkage after infinite isothermal time is temperature-dependent, the characteristic temperature-dependence being determined by the binder system.

201. JITSUMI, K. et alii: New process for producing electrode pitch. Aromatikkusu, Vol. 28. No. 3. 1976. pp. 115-120. /Japanese/

The Cherry-T Process for producing electrode pitch from coal tar is described. Reactive oil is poly-condensed by pressure treatment of coal tar to improve the yield and quality of pitch. The total yield of P-pitch and S-pitch is generally 73-76 wt %.

202. JOHN, P.T.; DATTA, K.K.: Influence of a prebake treatment on the strength of baked carbon products /molded or extruded/. Carbon, Vol. 13. No. 5. 1975. pp. 454-455. /French/

Molded C blocks were made from a mixture of C powders and pitch and prebaked before final baking. The prebaking heat treatment was heating to a particular temperature in the range 100° to 300°C in the presence of air and annealing at temperature 1-12 hr. The rate of heating was kept constant for all samples.

203. KALOC, M. et alii: Measuring pitch layer height in coking retort. Hutnicke Listy, Vol. 31. No. 10. 1976. pp. 688-694. /Czech/

The quality of the final product as well as the utilization of the coking retort is affected by the properties of the hard coal pitch and by the filling procedure of the coking retorts. If the regime of the retort filling is kept maximum, utilization of the retort inner space may be kept together with the higher yield of the pitch coke from the retort.

204. KAPELYANOV, V.Ya.; SOKOLOVSKAYA, I.B.: Wetting of solid carbon materials with pitch in the 80° to 130°C range. Koks i Himija, No. 2. 1975. pp. 40-41. /Russian/

Pitch granules 3 mm in diam were placed on a carbonaceous substrate /20 x 10 mm/ which was then inserted into an electric furnace with a

light at one end. The temperature of the furnace was raised 5 deg C/eec, and the granules were photographed every 10°C.

205. KARABON, B.; WIECEK, I.: Physico-chemical properties of group componente of coal tar pitch. Koks, Smola, Gaz, Vol. 20. No. 7-8. 1975. pp. 194-198. /Polish/

Physico-chemical properties were studied of group components of coal--tar pitch alpha$_1$, alpha$_2$, beta, and after their separation by extraction with selective solvents /quinoline, benzene, naphthaI/. The group components differed in physico-chemical and mechanical properties. Coking propertiee of the pitch depended mainly on the content of alpha components.

206. KATAYAMA, Y.: Relation between the structure of coke as revealed by the X-ray /002/ diffraction pattern and the structural and physical analysee of the raw aromatic heavy oil ends. Nippon Kagaku Kaishi, No. 9. 1975. pp. 1551-1554. /Japaneee/

The C etructures of cokes were correlated with the chemical structures of their raw materials. Physical and structural analyees were carried out on the extractive fractions /pyridine soluble and n-hexane in-eoluble/ of a series of pitchee which were different in cracking conditions and raw materiale.

207. KEKIN, N.A.: Molecular composition and structure of substances in coal tar pitches. Himija Tverdogo Topliva, No. 2. 1975. pp. 106-116. /Russian/

Bituminous coal-tar pitches I having softening point 56.5°C was eeparated into three fractions: alpha, beta, gamma /temperature rangee are not given/. The gamma-fraction wae cracked in sealed tube at 380°C for 95 hr. The spectra of the original fractions ae well as of the cracked product were considered to be very eimilar and the causes are diecussed.

208. KELLY, B.T.: The baeal thermal expansion of graphite and a relation-ehip between the bond bending resistance and the in-plane elastic constante.Carbon, Vol. 13. No..4. Aug. 1975. p. 350. /French/

The author previously preeented an analysis of new basal thermal expaneion data due to Yates and others, baeed on the idea that the bond bending coefficient delta introduced by Komatsu poeeeseed an unusual anharmonicity. However, Greene has derived a relationship /preeented/ between the coefficient and the in-phaee elaetic constans C11 and C12.

209. KIGEL, L.S. et alii: Accelerating the introduction of new constructions for recovery aggregatee in the roasting of coke. Cvetnye Metally, No. 8. Aug. 1975. pp. 44-46. /Russian/

Some new advances are discussed in recovery aggregates in roasting pitch coke used as raw material for producing anodes in Al and electrode plants. The tests of different modifications of these aggregates indicate the direction which should be taken in the production of rotating furnaces so as to decrease pollution, intensify and improve the effectiveness of the roasting process and economize on fuel by means of using secondary energy resources.

210. KIMBERG, G.M.; GRAY, M.D.: Comparison of evolution of heteroatoms from coal and petroleum based electrode cokes. In: "Petroleum Derived Carbons", 1976. American Chemical Society, pp. 444-450.

A route for making, from coal, a high-purity coke suitable for the manufacture of both graphite and C electrodes has been developed. This process for electrode coke involves the solvent extraction of coal and is part of a wider National Coal Board program into the beneficiation of coal which includes, besides electrode coke, hydrocarbon products, chemicals and C fibers. The heat treatment of cokes in the range 1300° to 3000°C is described.

211. KOLESNIKOVA, T.A.: Preparation of electrode coke from liquid pyrolysis products. Neftepererabotka i Neftehimija /Moscow/, No. 1. 1975. pp. 28-29. /Russian/

A kerosene-gas oil straight-run fraction of Romashkino petroleum was hydrorefined at 370°C and 30 atm on Al-Co-Mo catalyst to reduce the S content from 2.1 to 0.18%. The product was pyrolyzed at 780°C and contact time 0.6 sec with 70-100% water vapor to obtain C_2H_4 19.5, propylene 11 and liquid products 37% /raw material basis/.

212. KRAVTSOV, I.M. et alii: Anode paste mixing time. Cvetnye Metally, No. 2. Feb. 1976. pp. 47-50. /Russian/

Coal tar pitch binder /from the Western Siberian Metallurgical Plant/ with a softening temperature of 85° to 90°C is heated to 180° to 230°C and mixed only 40 min with 72.5-74.5% of a dry coke charge consisting of 15% petroleum coke and 85% pitch coke to prepare anode paste at the Novokuznetsk Aluminum Plant. Adequate impregnation of the coke-filler is reached in 40 min, anodes with minium electrical resistance are obtained after 30-40 min mixing.

213. LAPINA, N.A. et alii: Evaluation of the thermal stability of pitches. Cvetnye Metally, No. 12. 1975. pp. 39-42. /Russian/

The heat stability of pitch was evaluated by Rogue index, determined by the mechanical strength of the residue from calcining a 1:5

mixture of pitch and standard coke. The quinoline-insoluble fraction and the pitch quality index /coking residue/ x /C/H ratio/ were not related to Rogue index and compressive strength was not related to impact strength.

214. LAPINA, N.A. et alii: Relationship between pyrolysis activation energy and graphitizability, Carbon, Vol. 14. No. 1. Feb. 1976. pp. 39-41. /French/

The comparative investigations included organic materials of different nature and structure. Raw C materials were medium--temperature coal tar pitch and the components thereof /carbonides, asphaltenes and malthenes/. A relation is obtained between effective activation energy for pyrolysis and the interlayer spacing after treatment at 2700°C.

215. LAZAREV, V.D.; YANKO, E.A.: Study of some physico-chemical processes in pitch-coke compositions. Himija Tverdogo Toplina /Moscow/, No. 1. 1976. pp. 77-80. /Russian/

Electrode materials showed the effect of the composition of the coke filler on the mechanism of destruction of the anode. The specific surface, wettability and reaction capacity of the electrode powders were investigated. With increase of the content of glass less than 0.05 mm in the powder, destruction of calcined samples of electrode material was increased.

216. LOBOV, A.A. et alii: Study and improvement of the industrial method of calcining pitch coke under the conditions of a by-product coking plant. Koks i Himija, No.3. 1976. pp. 15-20. /Russian/

The relations of the properties and structure of pitch coke with the final heating temperature in chamber kilns and the calcining conditions were studied. The calcining of the pitch coke was carried out by the method of high-temperature high-speed heating. The calcining of pitch coke with a less organized structure and with a relatively high content of H led to more rapid processes of structure formation and to a final product of higher quality.

217. LOMOVTSEVA, M.A.: Production of an experimental batch of acicular--structure coke. Neftepererabotka Neftekimija, No. 3. 1976. p. 51. /Russian/

Cracking residue with density 0.949 and coking capacity 5.49%, from low-S low ash distillates of petroleum, was processed by delayed coking at 500°C and 1.75 recycle ratio to obtain 17.3% coke based on the feedstock. The acicular coke thus obtained was suitable for electrode manufacture.

218. MATUSYAK, N.I. et alii: Methods for producing electrode pitch and requirements set forth for its quality. Koks i Himija, No. 2. 1976. pp. 47-50. /Russian/

Processes developed in several countries are briefly reviewed. In the USSR, combined heat treatment and air oxidation is recommended for the production of pitch having a softening point about 90°C. Subsequent addition of anthracene oil is proposed for raising the softening point to about 150°C.

219. METRAILER, W.J. et alii: Properties of cokes produced in the flexicoking process. In: "Petroleum Derived Carbons" 1976. American Chemical Society, pp. 38-46.

Flexicoking is a fluidized bed process to convert highboiling petroleum fractions to light hydrocarbons, low-S fuel gas and coke. Coke gasification can be minimized if there is an outlet for low-S coke. The residue is a possible source of V and Ni. Flexicoke is easier to burn than anthracite coal, but more difficult than low--volatile bituminous coal.

220. PENDLEY, J.W.; BULLOUGH, V.L.: Laboratory and plant performance of petroleum pitch. In: "Petroleum Derived Carbons", 1976. American Chemical Society, pp. 110-121.

Laboratory findings showed that C electrodes, both prebake and Soderberg type, containing petroleum pitch performed as well in the electrolysis of molten salts as C electrodes containing coal tar pitch. Plant tests confirmed the laboratory findings that the consumption of C electrodes containing petroleum pitch was no different than the consumption of C electrodes containing coal tar pitch.

221. RICHARDS, B.P.: Activation energies for crystallite growth and ordering in graphitizing carbons. Pt. 1. Crystallite growth. Journal of Crystal Growth, Vol. 34. No. 2. July 1976. pp. 325-331.

X-ray diffraction shows that activation energies in the a- and c--directions are essentially single values, respectively, about 300 and about 210 kcal/mole. They are the same for all materials examined /petroleum coke alone or with tar ot pitch binder, and pitch coke alone or with pitch binder/ and independent of the extent of the transformation towards the graphite structure.

222. ROUCHY, J.P.; GATINEAU, L.: Changes in the arrangement and dimensions of the layers of a graphitizable carbon between 1700° and 2500°C. Carbon, Vol. 14. No. 2. 1976. pp. 97-104. /French/

A pitch coke is studied. Changes in tridimensional organization and layer growth were followed by comparing experimental radial distribution functions of samples treated at 1700°, 2050°, 2100° and 2500°C with synthetic functions calculated for a graphitic model with C-C distances less than 10 A.

223. ROUCHY, J.P.; GATINEAU, L.: Study of the evolution of a graphitizing carbon during thermal treatment using the radial distribution function. Carbon, Vol. 13. No. 4. Aug. 1975. pp. 267-274. /French/

The transient presence of interstitial carbons during transformation of a coke into graphite is inferred. A peak corresponding to an abnormal C-C distance 1.90 A. is observed for samples heat treated to 2050° and to 2100°C.

224. RUSIN, E.: Physicochemical properties and group composition of antrhracene extracts from coals. Koks, Smola, Gaz, Vol.20. No.11. 1975. pp. 306-313. /Polish/

Physicochemical properties and group components were studied of extracts from various coals using hydrogenated anthracene oil and also the physicochemical properties of the group components. The results were compared with the corresponding data obtained with coal--tar pitch and requirements for an electrode cement.

225. SAGET, J.P. et alii: Molten cryolite electrochemistry. Pt. 2. Electrochemical oxidation of "dissolved" aluminum. Electrochimica Acta, Vol. 5. No. 11. 1975. pp. 825-830. /French/

It is shown by voltammetry that the species often called "dissolved" Al which comes from the interaction of Al with molten cryolite is electrochemically oxidized at several electrodes /Pt, Ni, Cu, graphite, vitreous C/.

226. SATO, S. et alii: Determination of the thermal shock resistance of graphite by arc discharge heating. Carbon, Vol. 13. No. 4. Aug. 1975. pp. 309-316. /French/

The technique presented is a basic analysis of the nonsteady thermal stress in a circular disk heated by an arc discharge at its central point. The thermal stresses are considered here as being determined only by the temperature distribution at each instant. Thermal shock resistance is defined as the circumferential tensile thermal stress multiplied by the thermal conduotivity divided by Young's modulus and the thermal expansion coefficient.

227. SHIRAISHI, M.; SANADA, Y.: Layer stacking of mesophase in early stages of carbonization. Nippon Kagaku Kaishi, No. 1. 1976. pp. 153-160. /Japanese/

The layer stacking and the optically anisotropic texture of a mesophase were clarified by X-ray diffractometric and microscopio methods. The mesophase was obtained from four starting materials: coal tar pitch, virgin reduced crude, poly/vinyl chloride/ and 3,5--xylenol-formaldehyde resin by heat treatment at residence times up to 24 hr at fixed temperatures /370° or 430°C/.

228. SHREIDER, E.M. et alii: Improvement in the technological properties of electrode pitch coke. Koks i Himija, No. 4. 1975. pp. 20-22. /Russian/

Equipment installed in 1971 for dry slaking and calcination of pitch coke gave a product satisfactory for the production of electrodes. Results were given for the granulometric composition of the coke, and for moisture, volatile content, ash, true density and specific electrical resistance of different classes of size.

229. SMITH, W.E. et alii: Characterization of petroleum pitches used for coke production. In: "Petroleum Derived Carbons", 1976. American Chemical Society, pp. 63-76.

Pitch materials are used for road surfacing, roofing, adhesives, sealants and electrode fabrication. Nuclear magnetic resonance spectrometry aids in structural characterization and reproductibility of pitch and other petroleum-derived products by indicating the alipathic, alicyclic and aromatic content of petroleum feedstock and derived pitch.

230. STOKES, Ch.A.: Manufacture of industrial carbons from petroleum raw materials. In: "Petroleum Derived Carbons". 1976. American Chemical Society, pp. 1-17.

Raw materials from petroleum tar and distillation residues are insufficient to meet the anticipated demand for industrial C as C black, electrode pitch and petroleum coke. A typical specification for calcined petroleum coke for Al manufacture is: volatile 2.5 maximum, ash 0.05 maximum, Si 0.02, Fe 0.02, V 0.001, Ni 0.001, Mn 0.001, S 1% maximum. A depletion of coke supplies may lead to deviation from specification.

231. SVERDLIN, V.A. et alii: Study of the structure and properties of prebaked anodes. Trudy VAMI, No. 92. 1975. pp. 9-15. /Russian/

The physical and chemical characteristics of samples of prebaked anodes made in the U.S., Japan, Yugoslavia, Switzerland, France, Germany and the USSR are compared. Based on tabulated physical properties data, microstructural analysis and comparative anode life in electrolyzers, it was determined that inferior anodes had large pores /greater than 80 microns/. High-temperature baking and the use of pitch coke additions resulted in increasing anode density and decreasing porosity, and hence better properties. However, if the pitch coke additions were too high, anode life decreased.

232. SVIRIDA, L.V. et alii: Study of the carbonation process of coal-tar pitch under different conditions. Himija Tverdogo Topliva /Moscow/, No. 3. 1976. pp. 131-134. /Russian/

Carbonation of coal-tar pitch was studied in the temperature range 400° to 900°C in its own volatile atmospherically inert medium and after preoxidation. The yield of coke decreased from 91 to 40, of volatiles from 59.0 to 2.8% and its density increased with increasing final temperatures of carbonation. Maximum yield of coke was obtained after the carbonation of the preoxidized feedstock.

233. TAUSHEV, V.V. et alii: Rapid production of electrode pitch. Izvestija Vysših Učebnyh Zavedenij, Neft i Gaz, Vol. 18. No. 1. 1975. pp. 43-46. /Russian/

The process was carried out in three stages, which included treatment of the craoking residue at 460°to 510°C and 20-50 atm for 1-5 minute, thermal condensation of the product at 380° to 440°C and 12 or less atm and distillation of the light fraction at less than 1.5 atm to control the softening point of the pitch. The optimal conditions for each stage were selected based on the properties of the raw material and the pitch produced.

234. TSYPLAKOV, A.M. et alii: Energy characteristics of vertical-stud anodes of commercial aluminum cells with consumable copper studs. Trudy VAMI, No. 92. 1975. pp. 23-28. /Russian/

A study was made of the thermal and electrical fields associated with the use of consumable Cu studs in vertical-stud anodes of commeroial Al cells. It was shown that the Cu studs transfer a significant amount of heat away from the interelectrode space, which intensifies the cell process.

235. VOLFSON, G.I.: PUSTILNIK, G.L.: New methods of producing aluminum fluoride and cryolite. Cvetnye Metally, No. 11. 1976. pp. 77-82. /Russian/

Recent developments in the production of aluminum fluoride and cryolite in countries outside of the Soviet Union are reviewed. Descriptions and schematio drawings of processes developed and used at Österreichische Stickstoffwerke AG /AlF_3 and cryolite from H_2SiF_6/, Unie Van Kusmetfabriken /AlF_3 from H_2SiF_6 by a hydrochemical method/ and the Tennessee Valley Authority /AlF_3 and ammoniated cryolite from waste gases of phosphorus production/ are presented. Also discussed are processes developed in Yugoslavia and India.

236. WAGNER, P.: The dependence of thermal conductivity of binder residues on heat treatment temperature. Carbon, Vol. 14. No. 1. Feb. 1976. pp. 71-73. /French/

Molded graphites made with the same filler flour, with either 35 parts/hundred pitch or 28 parts/hundred partially polymerized polyfurfuryl alcohol catalyzed with 4% maleic anhydride were studied. The thermal conductivity data were analyzed in terms of a two--component system and the binder residue thermal conductivity calculated. Both binder residues show an increase in thermal conductivity with increasing heat treatment.

237. WATANABE, T.: Carbon materials used for smelting aluminum. Nippon Light Metal Research Institute, Nenryo Kyokai-Shi, Vol. 54. No. 8. 1975. pp. 644-652. /Japanese/

A review on the use as anodic and cathodic electrodes of C materials in the electrolytic smelting of Al.

238. WEGE, E.: Development in graphitizing practice. High Temperature High Pressures, Vol. 8. No. 3. 1976. pp. 293-305. /German/

The energy utilization of discontinuously operated Acheson furnaces for graphitization of shaped C bodies is comparatively low. Further disadvantages are the pollution rate and the difficulty of producing very uniform graphite grades. Measures for overcoming these disadvantages and the potentials of other graphitizing methods--the Castner process and indirect methods--are discussed.

239. WHITE, J.L.: Mesophase mechanisms in the formation of microstructure of petroleum coke. In: "Petroleum Derived Carbons". 1976. American Chemical Society, pp. 282-314.

The microstructures of most petroleum cokes produced by delayed coking are comprised of complex mixtures of microconstituents whose structures are established during the brief plastic life-time of the carbonaceous mesophase. The experimental methods of incremental pyrolysis and polarized-light micrography have proved to be useful tools in understanding how the structures of each of these microconstituentes are formed.

240. YANKO, E.A. et alii: Investigation of the composition of ash impurities of electrode cokes. Cvetnye Metally, No. 2. Feb. 1976. pp. 50-52. /Russian/

Ash and S content and metal ash impurities as oxides SiO_2, Fe_2O_3, MnO, TiO_2, Cr_2O_3, V_2O_5, K_2O and Na_2O were determined for pitch cokes and petroleum cokes from 17 Soviet sources. The effect on Al electrolysis efficiency, C anode stability and contamination of Al and Al alloys for electrical, construction and casting purposes was discussed.

241. YANKO, E.A. et alii: Quality requirements of petroleum cokes for anode mass production. Cvetnye Metally, No. 4. Apr. 1976. pp. 44-47. /Russian/

Critical parameters in raw materials for cokemaking were evaluated from the standpoint of anode paste quality. Physical and chemical properties for four types of coke are presented. Anode compositions made from directly extracted products /black oils, tars, etc./ by slow coking methods had strength levels of 190-250 kg/sq cm, which are satisfactory for quality requirements.

7. ENVIRONMENTAL ASPECTS IN PRIMARY ALUMINIUM PRODUCTION

242. Activated carbon from aluminum-electrolysis dust. Showa Denko KK. No. 75 122,489 /13 Mar. 1974/. /Japanese patent/

Powdered carbon separated from Al-electrolysis dust is soaked in a chloride-containing solution and activated by calcination at 300° to 850°C to yield an activated C. The process also solves the disposal problem of Al-electrolysis dust.

243. ALEKPEROV, I.I. et alii: Hemodynamic indexes under the influence of fluorine compounds. Gigiena Truda i Professional'nye Zabolevanija, No. 4. 1975. pp. 43-44. /Russian/

The concentration of F compounds /HF, NaF, AlF_3/ in the air of the electrolysis department of an Al plant often exceeds the maximum permissible concentration /HF 0.7-1.11 mg/cu m/. Clinical examination of 90 workers of the electrolysis department show that their hemodynamic indexes /amplitudes of the systolic waves on rheograms, rheographic index and the amplitude-frequency index/ are lower than that of a control.

244. Aluminum electrolyzer cover--Compressed air feed through perforated tube maintains total hermetization. Leningrad Civil Engineering College, No. 439,544 /30 May 1973/. /Soviet patent/

The Al electrolyzer cover consists of gas collector, lid, power drive, horizontal stand and an air-tight assembly. To prevent escape of gases from the electrolyzer during service, the lid is locked with a perforated tube with valves. Compressed air is fed into the tube at the moment of air-leak and thus complete hermetization is maintained.

245. BARRILLON, E.: Mechanism of carbon dust formation in aluminum reduction pots. ICSOBA Tray., No. 10. 1973. pp. 87-94. /French/

Factors in anode-C consumption and C-dust formation, potline overheating due to excess C skimmings and adjustment in the manufacture of prebaked anodes are discussed. It is essential to distinguish between the electrochemical combustion of the anode and its thermal decomposition.

246. Collecting gas from molten electrolyte in aluminum manufacturing. Pepro Pechiney Progialum, No.2508,219 /28 Feb. 1974/. /German patent/

The gas from a cell used for the manufacture of Al from a molten electrolyte is collected by breaking the crust on the electrolyte holding the resulting hole open so the gas on top of the bath can be mixed with air and collected. The device includes a movable rod used to break open the crust and a gas extractor which covers the hole and is connected to an extraction pipe.

247. DELOY, J.Ch.: How to reduce fluoride pollution. Industries et Techniques, No.299. 20 Oct. 1975. pp. 41-42. /French/

The Aluminium Pechiney Electrolysis Works at St.Jean de Maurienne and its F-containing effluents are described. In 1974 such emission reached a maximum of 1400 tons/year for a production of 75,000 tons Al. The emission is toxic to vegetation and animals. Since the end of 1972, Aluminium Pechiney has undertaken a program of fluoride emission reduction at a cost of 40 million francs.

248. Electrolytic treatment of fluorine-containing waste waters. Kurita Industrial Co., Ltd. No. 75 072,449 /30 Oct. 1973/. /Japanese patent/

Fluorine-containing waste waters are treated with Ca salts at over pH 10 to remove a major portion of F as CaF_2, and the treated waste water is electrolytically treated by using Al electrodes. The pre-treatment with Ca salts decreases Al consumption and amount of sludge formed. Thus, a waste water containing 35.5 ppm F from an Al processing plant was mixed with 500 ppm Ca as $CaCl_2$ and was adjusted to pH 11.0 with NaOH. The sludge formed was removed by filtration. The filtrate was neutralized and electrolyzed at 1 A for 2 min by using Al electrodes. The treated water contained 3.2 ppm.

249. Electrolyzer anode gases burner. Irkutsk Aluminium Works, No. 466,296 /25 May 1973/. /Soviet patent/

The anode gases produced during the electrolysis of Al are collected under the hood and reach the header via the angular connecting pipes. The gases mix with atmospheric air drawn in by the flue blower through the clearance between the combustion chamber wall and the header, and then reach the combustion chamber. The combustion products are fed to the gas scrubber via a branch pipe. The unit enhances the stability of anode gases burning. The reduction in the number of combustion chambers simplifies the servicing.

250. Extraction system for collecting noxious gases from furnace used to produce aluminum from fused electrolyte. Elkem Aluminium AS. No. 2539,145 /4 Sept. 1974/. /German patent/

Device for the collection of gases from furnaces used for the produotion of Al by electrolysis of a fused bath in which the electrio current is fed by vertical contact bolts to the anode, and in which the anode is surrounded by a gas-collecting hood resting on the surface of the bath. A casing is formed around the furnace to leave an intermediate space for the extraction and removal of the gases.

251. FARRIER, P.M.; COATES, F.I.: Influential factors in the control of effluent emissions from the bluff aluminium smelter. In: Proceedings of the Clean Air Conference, Auckland, N.Z. 1975. Clean Air. Soc. Aust. N.Z. Vol. 2. 1975. pp. 511-527.

Site development, meteorological conditions, and economcs are discussed and the physical pot operations, effluent collecting system and monitoring program /internal and external/ are described. The effects of fluoride emission on the adjacent areas were examined.

252. FRANKENFELDT, R.E.: Environmental conservation through recycling of materials used in the electrolysis process. Aluminium, Vol. 51. No. 11. 1975. pp. 716-719. /German/

Losses of materials, especially of fluorides which occur in the gaseous phase or at the cathode during the electrolytic reduction of Al_2O_3 are investigated. By systematic plotting and determination of the total fluoride loss the conditions for a cryolits synthesis in the electrolysis cell are stated and the possibilities of fluoride recovery are discussed.

253. FRANKENFELDT, R.E.; MANNWEILER, U.: Metal quality as a function of degree of pick-up of furnaoe waste gases in aluminum electrolysis oells. Erzmetall, Vol. 29. No. 3. 1976. pp. 130-133. /German/

The purification of waste gases of encapsuled electrolysis cells through dry adsorption with alumina permits a practically quantitative recovery of the fluoride. At the same time, however, volatile compounds of elements which may have a harmful effect on the metal quality or current efficiency will also be pioked up and carried back with the alumina into the electrolysis cell.

254. Fume extraotion system for electrolysis cell. Aluminium Pechiney, No. 2515,055 /11 Apr. 1974/. /German patent/

Aluminium manufacture by electrolysis in a cell, using a jacketed C anode immersed in the electrolyte, the cathode being formed by the bottom of the cell, has the bottom of the jacket ending in a hood to

provide a primary circuit for gas and dust extraction. A movable wall is pounted on the jacket on each long side of the cell, the top of the wall being gas-tight while an air gap is left between its bottom edge and the cell.

255. Furnace effluent filter for a carbon baking furnace. Reynolds Metals Co. No. 3,940,237 /13 Dec. 1974/. Official Gazette, 24 Feb. 1976. /U.S. patent/

In a C baking syetem having a furnace, and means for mixing carbonaceous aggregate with a suitable binder and forming the mixture into green C bodies for baking in the furnace at elevated temperature, the improvement comprisee a filter unit for treating the furnace effluent using a bed of carbonaceous aggregate as the filter medium, with provision to recover the used carbonaceous filter material from the filter unit in a form suitable for making such green C bodies.

256. GALIPEAU, A. et alii: Converting of HS Soderberg cells to prebake cells. In: "Light Metals 1976". Vol. 1. New York, 1976. AIME, pp. 131-147.

Due to environmental pressures, several alternatives were studied to overcome pollution problems related to the HS Soderberg cells. One of the economically attractive alternatives is the modification of the present exieting HS Soderberg superstructure to accomodate eight pairs of prebaked anodes of the dimensions currently used in the 65 kA prebake celle at Arvida.

257. KAINDL, K.: WACHA, E.: Human biological inveetigations into the influence of fluorine from aluminum production. Aluminium, Vol. 52. No. 2. 1976. pp. 111-113. /German/

At a very early stage the Al industry introduced techniques for waste gas purification to satiefy the increased obligations of environmental conservation. In this connection, it is necessary to produce evidence that the F emiseions are not dangerous to health. Within the bounds of an extenaive research program in Austria, the F content of the blood and urine, the CO content of the blood, 11 different enzyme systems and serum protein samples were investigated.

258. KIGEL, L.S. et alii: Accelerating the introduction of new constructions for recovery aggregates in the roasting of coke. Cvetnye Metally, No.8. 1975. pp. 44-46. /Russian/

Some new advancee are discussed in recovery aggregates in roasting pitch coke used as raw material for producing anodes in Al and electrode plants. The teets of different modifications of these aggregatee indicate the direction which should be taken in the

production of rotating furnaces so as to decrease pollution, intensify and improve the effectivsness of the roasting process and economize on fuel by means of using secondary energy resources.

259. KLIMENKO, V.P. et alii: Desilication of fluoraluminate liquours. Cvetnye Metally, No. 7. 1976. pp. 47-48. /Russian/

A study of the desilication conditions for fluoraluminate liquors at atmospheric pressure was conducted on liquors obtained from the leaching of wastes under optimal conditions. The temperatures of 80° and 100°C were tested, and the effects of muds from the leaching process were studied. The desilication time varied from 0.5 to 24 hr.

260. KONSTANTINOV, V.G. et alii: Problem of the carcinogenic hazard in aluminum electrolysis halls. Professional'nyi Rak, 1974. pp. 6. /Russian/

During the self-baking process of the anodes under the influence of the heat generated in the reduction cell, the coal pitch undergoes decomposition to form a large quantity of volatile resinous substances, whose composition includes polycyclic aromatic hydrocarbons, including benz/a/pyrene. The emission of these substances into the air takes place during the operations of refurbishing the samples, the extraction and insertion of the current-conducting studs, from the exposed upper surface of the anode, from the pitch flowing onto the electrolyte process, etc.

261. KUELSKE, S.: Checking a multisource model by using an isolated surface emitter and parallel emission measurements. VDI Berichte, Vol. 200. 1973. pp. 189-198. /German/

A multisource model is employed to analyze the F-concentration in the vicinity of an Al smelter. Concentrations were calculated for selected meteorological conditions and for a 5 x 5 sq km grid with a spacing of 200 m. By using mobile measuring devices, measurements were taken in the plume from the set of emitters. The calculated results were compared with the measured F-concentrations and a graph is presented plotting F-conclusions against distance from the emitters. Calculated and measured concentrations were in fair agreement for distances less than 400 m and over 1200 m.

262. MALTS, V.C.: Physical-chemical properties of the dust and solutions in the scrubbing of gases from /aluminum-silicon carbothermic/ furnaces. Trudy VAMI, No.89. 1974. pp. 88-93. /Russian/

The results of a study of gas scrubber action at the Dneprovsky Aluminum Plant are presented. The size distribution of dust particles generated in the production of Al-Si alloys is shown. Chemical

analysis indicated that the dust was 27-32% SiO_2, 27-40% Al_2O_3, 10-14% Na_2O and 10-12% combustibles. Median particle diameter was 1.7 microns, and the 0-5 microns fraction composed 75-77% of the total. An addition of 0.1-0.2% of a surface active agent to the circulating solution did not improve wetting action.

263. MALTS, V.S. et alii: A study of the electrokinetic potential and hydrophilic nature of slime from wet gas scrubbing in the production of Al-Si alloys. Izvestija Vysših Učebnyh Zavedenij, Cvetnaja Metallurgija, No.5. 1975. pp. 48-51. /Russian/

The electrokinetic potential and hydrophilic characteristics of wet scrubber slime from Al-Si alloy production were determined in solutions with different contents of caustic soda and sodium carbonate and sulfate. As the concentration of the above compounds increased in solution, the electrokinetic potential of the slime and of its basic components decreased. The rate of decrease was greatest as the Na_2O concentration increased to 20-30 g/l.

264. MOROZOVA, V.A.; RZHECHITSKY, E.P.: Sulfate compound precipitation during the concentration of aluminum plant gas purifier solutions. Cvetnye Metally, No.6. 1975. p. 6. /Russian/

A study was made on the composition of salts in the waste water of Al plants and means were developed to remove sulfate compounds from it. Scrubber water solutions, in which the sodium sulfate concentration was as high as 70-90 g/l, were evaporated and the crystallized products analyzed.

265. Process and apparatus for collection of gases, Aluminium Pechiney, No. 3,977,950//28 Feb.1974/. Occifial Gazette, 31 Aug. 1976. /U.S. patent/

A process for the collection of gases from a tank used in the production of Al by igneous electrolysis, comprises piercing a hole in the crust which normally covers the electrolytic solution with a movable shaft, maintaining the hole thus formed in the crust open, maintaining a flow of at least coolant gas about the shaft in admixture with the gases emitted through the hole and collecting the released gases.

266. RADKE, D.: Dry purification processes for waste gas discharges of dust and hydrogen fluoride. Technische Mitteilungen, Vol. 67. No. 11. 1974. pp. 484-489. /German/

Dust and HF are removed from waste gas by whirling with burnt lime in cyclone-type funnels. Gas containing HF less than 1 mg/cu m is obtained.

267. Regeneration of alumina-based adsorbents. Vereinigte Aluminium Werke AG. No. 2346,537 /15 Sept. 1973/. /German patent/

The impurity content of Al_2O_3, sodium aluminate and/or mixed Al/ /alkali metal oxide adsorbents for removing F compounds from waste gases is reduced by heat treatment in the presence of H_2O. The adsorbents are especially those used for removing HF from gases produced in the electrolytic production.

268. Removing impurities from gases evolved in aluminum manufacture by injecting alumina powder of known size into gas stream. Hosokawa Funtai Kog. No. 2525,089 /6 June 1974/. /German patent/

Dry washing process for the removal of substances conveyed by air from the gaseous byproducts arising in the production of Al comprises; /a/ injecting alumina powder into the stream of gaseous byproducts; /b/ collecting the reaction mixture from /a/ in a filter; /c/ removing particles below a predetermined size from the mixture; /d/ returning the processed mixture to the melting furnace used for Al production.

269. Report of the Interprofessional Technical Center for Studies in Atmospheric Pollution. 1975. L.R.F. and C.E.N.G. Document No. 280. pp 4. /French/

The main aims of the measurements made in primary Al smelters were to compare the methods and results of measurements used and obtained by the L.R.F. and the C.E.N.G. in ducts and chimneys at St. Jean-de--Maurienne, and to determine the reliability of the measurement of the rate of ventilation of the pot rooms by the thermal balance method, and the reliability of the measurement of F using CO_2 as tracer, for diffuse emission from electrolytic cells, in particular, at the roof lights.

270. SHCHIPKOV, V.I. et alii: Possible existence of a temperature blanket and its effect on the industrial-hygiene conditions in aluminum pot-rooms. Trudy VAMI, No.89. 1974. pp. 53-61. /Russian/

Ventilation in Al potrooms was studied in regard to industrial hygiene. A 1:15 miniature model of a potroom was built, and temperature distributions and air flow were measured in the vicinity of an operating cell. A temperature difference of as high as 6°C exists between the top and bottom of the potroom.

271. SHRAMBAN, B.I. et alii: Sorption of hydrogen fluoride from wet gases by the anion exchanger AV 17 under static conditions. Pt. 1. Kinetics of hydrogen fluoride absorption. Zurnal Prikladnoj Himii, Vol.49. No.9. 1975. pp. 2323-2326. /Russian/

An empirical equation was derived for calculating the kinetics of HF sorption on AV-17 anion exchanger from humid gas phase. It was

derived from experimental data obtained at 45° and 60°C by using various granulation size exchangers /0.316-1.15 mm diam/. The change of the exchanger humidity during the sorption is explained. The sorption rate constants are given for granule diam 0.25-1.0 mm.

272. TEDDER, Yu.R.; CHASCHCHIN, V.P.: Effect of alumina used in aluminum electrometallurgy on the air of electrolysis departments. Gigiena Truda i Professional'nüe Zabolevanija, No.4. 1975. pp. 5-8. /Russian/

Changes in the propertiee of the alumina used in Al production may influence the degree of air pollution in electrolysis workshops in terms of dust and fluoride compounds. Commercial types of alumina absorb HF and other gasee. The degree of absorption is linearly related to the alpha-form content of alumina. The amount of dust present in the air depends on the particle size characteristics of alumina. Better working conditions can only be obtained by using alumina with low dust-producing capacity.

273. THOMPSON, G.S.: Development document for effluent limitations guidelines and new source performance standards for the primary aluminum smelting subcategory of the aluminum segment of the nonferrous metals manufacturing point source category. Final report, Washington, D.C. Mar.1974. Environmental Protection Agency, pp. 142.

Effluent limitations, guidelines and standards of performance for the Al industry are presented. The degree of effluent reduction attainable through the application of pollution control technology is indicated. The data recommendations provided relate to the production of primary Al by the electrolysis of alumina.

274. Very considerable reduction of fluorine pollution at the Aluminum Works in the Maurienne-Vally. Nuisances Environ., No.43. Aug.-Sept. 1975. pp. 45-47. /French/

A historical outline is given of the effects of pollution due to the erection of large Al electrolysis plants by the PUK Group in the Valley of the Maurienne. In 1964, F emission reached 1400 tons/year. Thanks to effort made in recent years, the emission in 1975 will be of the order of only 450 tons/year. The considerable work involved in achieving this reduction at a cost of 40 million francs is described. A program of works modernization aimed at increasing Al production from 91,500 to 119,000 tons/year, while at the same time reducing pollution still further, is in progress.

8. ECONOMIC AND COMMERCIAL ASPECTS OT THE ALUMINIUM PRODUCTION

275. BIRSEN, D.; SZŐCS, C.: Programing the extraction of metals with the help of automatic data processing methods at the Slatina Aluminum Works. Metallurgia, Vol. 27. No. 6. 1975. pp. 298-299. /Rumanian/

Programing of operations in the electrolysis plant and the foundry of the Slatina Aluminum Works by shift foremen is unsatisfactory. Among other things, there is no over-all view of the operations and there is not sufficient time for adequate preparation of furnace charges. These conditions and others lead to loss of efficiency and increases in manufacturing costs.

276. CHAPMAN, P.F.: The energy costs of producing copper and aluminium from primary sources. No. FRG001. 1973. Open Univ. Energy Research Group Report, p. 78. /Pamphlet/

The total energy costs of producing Cu by the three stages of mining, crushing and flotation and smelting and refining are estimated with reference to their dependence on the grade of ore used. Consideration of the energy costs involved in the production of Al from bauxite shows that Cu is eight times less expensive to produce. Future processes for the extraction of Al from clay are likely to be cheaper than those for the production of Cu from sea water, so that Al will replace Cu in many applications.

277. CHERMETTE, A.: Fluorspar in 1975. Mines et Métallurgie, No. 128-129. Jul. Sept. 1976. pp. 100-101. /French/

The persistence of the world economic crisis during 1975 caused a new drop in fluorspar production which fell from 4.7 Mt in 1974 to 4.5 Mt in 1975. Local factors also contributed to this slight recession compensated, however, to some extent by the development of new resources. In the Al industry the anticipated fall in consumption of fluorspar in the near future is likely to be due more to the recycling of fluorinated products than the costly recovery of F in the phosphate industry.

278. CHURCH, F.L.: Northwest power crisis could black out one-third of U.S. aluminum capacity. Modern Metals, Vol.32. No. 8. Sept. 1976. pp. 25, 27, 29-30., 33-34.

Increased demand for electric power with delays in construction of thermal generating plants threatens to shut down primary Al smelters in the Northwest. Lack of alternative fuel has made electric power the main and cheapest energy in the area but its maximum potential will soon be exploited. Backed by the National Environmental Policy Act, environmentalists are stalling construction until 1978.

279. GRAY, P.M.F.: Conservation in primary extraction processing. In: "Energy and Waste in the Non-Ferrous Metals Industry". Oxfordshire, England, 1975. ENF Metals Technology Centre, 7 p.

The balance between the need for conservation and economics in primary extraction processes is reviewed for Al, Cu, Zn, Pb and Ni. Topics covered include the efficiency of extraction, energy requirements and the handling, conversion and disposal of waste products with mir ~um pollution.

280. GUINARD, C.: Energy and the primary aluminium industry. Revue de l'Aluminium, No. 453. Jul. 1976. pp. 333-334. /French/

In countries characterized by the non-availability of reasonably priced local energy sources, the opportunities for expansion of capacity appear very limited due to the expected low profitability levels of new smelters in these countries. The main effects on the structure of the industry of the energy crisis is thus expected on the future locational patterns of new reduction plants.

281. GUINARD, C.: Inflation and the aluminium industry. Revue de l'Aluminium, No. 452. Jun. 1976. pp. 273-277. /French/

There appear to be two main effects of inflation on investment and capital formation in the aluminium industry. Firstly, inflation acts to restrict the availability of capital for investment purposes through the erosion of real profits in the industry and more expensive external finance, and secondly inflation increases the supply price of the capital cost of assets.

282. MONTGOMERY, G.: Fluorspar. Mining Engineering, Vol.28. No.3. 1976. pp. 35-37.

The U.S. fluorspar mining industry declined to an all-time low in 1975. Most of the fluorspar consumed came from Mexico. World reserves are listed as about 20 years' supply at projected usage levels with Mexico leading, followed by South Africa, Thailand, England, U.S., USSR, China, etc. In the U.S. over 80% of domestic fluorspar comes

from the Illinois-Kentucky district. A recent development was the discovsry of a deposit in Tennessee. In spite of the decline in fluorspar consumption prices remained unchanged.

283. GOSSLING, H.H.: An updated summary of the world's fluorspar industry, 1975. Milner Park, Johannesburg, South Africa, 9 Mar. 1976. National Institute of Metallurgy, 29 p. /Pamphlet/ /NIM Rep. No. 1814/

The consumption of all grades of fluorspar in the Western World decreased by 4.7% from 2.54 million tons in 1974 to about 2.42 million tons in 1975, but is expected to incrsase from the last quarter of 1976 onwards. In 1975, steelmaking accounted for 53% of the consumption, the balance being consumed, in order of importance, by the following industries: fluorocarbons /25.7%/, Al /16%/, stainless--steel pickling /3.2%/, petroleum alkylation /1.8%/, and U enrichment /1.1%/. South Africa has the largest proven ore reserves containing approximately 29 million tons of CaF_2 and with a production capacity of 420,000 tons in 1975, ranks third among the fluorspar-producing countries. South African sxports of some 123,000 tons in 1974 represented 2.6% of world production.

284. JAKOVLJEVIC, M.: Industrial scale research of the optimal working of electrolytic cells for aluminium. Rud. Metal. Zb., No.2/3. 1974/1975. pp. 195-207. /Slovenian/

The relation for the best equilibrium of the electrolytic cell was simplified by compensation for the hsat losses due to the heating of input materials and due to increase of the entropy of alumina decomposition. The compensation is achieved by heat input with flue gases and the combustion heat of C. Design development of modern cells resulted in a high degree of thermal insulation, that is, specific losses of heat in the surroundings are only 1.25-1.30 W/sq cm. If the portion of total specific heat consumption needed for ths compensation of heat losses through the unheated surfaces is reduced to only 5-6%, the energy yield in modern cells reaches the value of 50%.

285. JAKOVLJEVIC, M.: Energy use and flexibility of an alumina elsctrolysis process. Hemija Industrija, Vol.30. No.1. 1976. pp. 15-18. /Serbo--Croatian/

The flexibility of the technology in Al production was considered from the viewpoint of oscillations in the supply of energy to the electrolyzer. The thermal equilibrium in the electrolyzer was analyzed and the consequences resulting from short breaks in the energy supply in the process, are discussed.

286. MASAO TAKAHASHI; NOBORU MASUKO: Energy evaluation of aluminum production. Yoyuen, Vol.19. No.2. 1976. pp. 161-176. /Japanese/

A proposed process for Al production and also conventional methods are discussed from the viewpoint of energy consumption. The heat balance of electrolytic furnaces in the Hall-Heroult process operated by internal heating was calculated. By decreasing the electrolyte density and electrical resistivity, the Al solubility in the electrolyte current density and electrode distance, energy consumption decreased. Reduction of Al_2O_3 and direct thermal decomposition of Al_2O_3 were compared.

287. OECD Report: Industrial adaptations in the primary aluminium industry. Revue de l'Aluminium, No. 453. Jul. 1976. p. XXI. /French/

The report gives an analysis of the possible structure of the primary aluminium industry, the developments in regard to energy consumption, the situation of bauxite supply, the recovery of waste and recycling, as well as of the conditions caused by inflation and the accumulation of capital.

288. SHTERN, V.I.: The effect of varying the strategy of running aluminum cells on the economic indicators of aluminum production. Trudy VAMI, No.89. 1974. pp. 46-52. /Russian/

Process control algorithms for Al cells were analyzed on the basis of cost of producing Al. Equations are presented for unit cost of Al and production cost losses relating to cell operation. The equations show that current stabilization can reduce costs by 0.04-0.06%. Also, decreasing voltage by 0.1 V at a constant current level can reduce the cost of Al by 0.6-0.7%.

289. TOSIAKI IUCHI; KAZUMASA ARAI: Aluminum electrolysis technology in a power saving age. Journal of the Japan Institute of Light Metals, Vol. 25. No.7. 1975. pp. 267-277. /Japanese/

Energy saving technology means d.c. power consumption decreasing technology. Power consumption decreases with the decrease of cell voltage drop and the rise of current efficiency. In recent years, cell size has shown a growing trend to save man power. Thus, the technology concerning low cell voltage and high current efficiency in large-size cells is explained. The value of about 12.2 kwh/kg of Al seems to be anticipated as the lower limit of power consumption. Thermal balance, cell voltage drop and shape of freeze of electrolyte formed on side surface of cathode are reviewed.

290. TVARDOVSKII, P.M.: Statistical study of energy characteristics of aluminum electrolysis. Electrichestvo, No.1. 1973. pp. 74-77. /Russian/

Using statistical methods a study was made on the relation of the process parameters to energy characteristics of the thermoelektrochemical process for Al recovery. Empirical expressions, modeling with sufficient accuracy the following interpendences of electrolysis parameters were developed: consumption of the electric power, current efficiency, current intensity, anodic current density, mean cell voltage, electrolyte temperature, the cryolite coefficient, metal and electrolyte level as well as empirical equations describing the statistical relations. The results of calculations and the relations obtained were presented as well as an analysis of the method errors and practical examples.

291. WILKENING, S.: Characterization, quality development and market situation of petroleum coke for the production of aluminum. Erzmetall, Vol.29. No.6. 1976. pp. 255-261. /German/

A survey is given of the relevant quality characteristics of petroleum coke and the way in which they are affected by the origin of the crude oil, the working up of the oil and the treatment of the raw coke. The Al industry, with a 40-45% share of the marketable raw petroleum coke, is the largest petroleum coke consumer. The supply of petroleum coke to the West European Al smelters is discussed and the further development of quality and production considered.

292. ZHELEZNOV, V.A.: Some ways for further reducing costs in the production of raw aluminum. Cvetnye Metally, No.12. 1975. p.7. /Russian/

In Al production the most important factors in the cost are expenditures for raw materials, basic materials and electrical energy. Alumina losses can be reduced through care in transportation and feeding. Some cost reduction is possible by lowering F consumption and recycling it. Electrical energy consumption has been reduced by the installation of automated process control. Modernization of obsolete types of pots and installation of prebaked anode cells is expected to reduce energy consumption. Reducing down time and increased labor productivity will also aid in reducing costs in Al production.

9. PROPERTIES AND QUALITY PROBLEMS IN THE PRODUCTION OF PRIMARY ALUMINIUM METAL

293. BALASHOVA, Z.N. et alii: Diffractometric investigation of the phase composition of synthetic and commercial electrolytes for aluminum production. Trudy VAMI, No.92. 1975. pp. 38-47. /Russian/

The phase composition of mixtures of $nNaF.AlF_3$-CaF_2, $nFaF.AlF_3MgF_2$ and $nNaF.AlF_3CaF_2$-MgF_2, prepared at 950° to 1000°C under an Ar atmosphere, was determined by diffraction analysis and compared with the phase composition of commercial electrolytes used in Al cells. Several compounds were identified.

294. BURNAKIN, V.V. et alii: Dynamics of gas evolution from melts in large laboratory apparatus having a horizontal anode. Izvestija Vyeŝih Učebnyh Zavedenij, Cvetnaja Metallurgija, No.3. 1973. pp.5. /Russian/

A study was made of the hydrodynamics of two-phase flow /electrolytic and anodic gases/ under the heel of the anode and in the side-anode area in a large laboratory stand.

295. Determination of alumina concentration. Nippon Light Metal Co. No. 75 021,794 /23 June 1973/. /Japanese patent/

Samples of molten electrolyte for electrolysis of Al are solidified very rapidly and the Al_2O_3 contents are determined by optically measuring the luminosity of the solidified samples. The rapid cooling of the molten electrolyte prevents the precipitation of Al_2O_3 near the surface of the material and makes the color of the solidified material gray, the luminosity of which increases with increasing Al_2O_3 content.

296. DEWING, E.W.: Thermodynamics of the system $LiF-AlF_3$. In: "Molten Salts", Princeton, N.J. 1976. Electrochemical Society, pp. 338-351.

It is demonstrated from the liquidus curve that solid Li_3AlF_6 is stoichiometric. Solid-electrolyte concentration cells have been used to determine the free energy of $3LiF/s/ + AlF_3/g/ = Li_3AlF_6/c/$.

297. DOBROKHOTOV, V.B.: A new method for determining heat losses in an aluminum cell. Trudy VAMI, No.89. 1974. pp. 24-28. /Russian/

Miniature differential thermocouples of special design were used to measure temperature profiles and, hence, heat losses in different

parts of Al cells. The specific heat losses ranged from 338 to 3650 W/sq m, depending on location. Values are presented for several locations in the anode and cathode portions of the cell.

298. FATKULLIN, I.G. et alii: Coprecipitation of small amounts of fluorine with aluminum hydroxide precipitates. Zurnal Prikladnoj Himii, Vol.48. No.7. 1975. pp. 1428-1431. /Russian/

Fluorine removal from water by $Al(OH)_3$ precipitated from $Al_2(SO_4)_3$, $AlCl_3$ and $Al(NO_3)_3$ solutions was studied. The maximum degree of removal was 95-97%. The optimum pH was 6.3-6.7. Experiments were carried out under static conditions in 100 ml of solution at 18° to 20°C. The pH was adjusted by HCl or NaOH.

299. HOMSI, P.: Chemical and electrochemical properties of molten $NaF-AlF_3$ mixtures. Lyon, 1975. pp. 180. /French/

Thesis. The thesis is divided into the following six chapters: bibliographical data on the $NaF-AlF_3$ equimolar mixture; the molten solvents, cryolite and sodium-tetrafluoroaluminate and exchange reactions of the fluoride ion, the oxide ion and oxidation/reduction reactions; electrochemical properties of molten sodium-tetrafluoroaluminate; potentiometric determination of the dissociation constants of molten cryolite and sodium-tetrafluoroaluminate; study of fluoride ion donors and acceptors in the given molten medium; and behavior of metallic oxides in molten $NaF-AlF_3$ mixtures.

300. Ion concentration determination in molten material. Krasy Nonferrous Institute, No. 458,757 /21 Apr. 1971/. /Soviet patent/

The composition of pools of molten material is determined in the nonferrous metallurgy during the electrolytic production of Mg, Al, rare and rare-earth metal by measuring the ion concentration. The solubility of the material of the electrodes used for the measurement of the maximum current in the electrochemical cell complicates the conventional procedures.

301. IVASHENTSEV, Ya.I. et alii: Determination of some of the parameters of the process for the electrolytic preparation of aluminum. Zavodskaja Laboratorija, No.7. July 1975. pp. 856-857. /Russian/

The probability characteristics were determined and tabulated for the errors in determining the main parameters of the electrolytic process /temperature of the melt, cryolite ratio, distance between the electrodes, levels of the metal and the electrolyte/. The index of the process was taken as the current yield of Al. A series of 50-60 parallel determinations were made of each parameter.

302. KINOS, D.L.; HAUPIN, W.E.: Electrical conductivity and density of chloride melts. In: "Molten Salts". Princeton, N.J. 1976. Electrochemical Society, pp. 375-387.

The electrical conductivity and density of chloride melts containing LiCl, KCl, $CaCl_2$, $MgCl_2$, NaCl and $AlCl_3$ were determined as a function of temperature between 700° to 750°C. All of the melts deviate negatively from the additive electrical conductivity law. The conductivity of melts can be predicted.

303. KUNIO NISHIMURA et alii: Use of radioisotopes in high-temperature reactors and the related technology, Nippon Aisotopu Kaigi Hobunshu, Vol. 11. 1973. pp. 329-335. /Japanese/

A review is given on use of radioisotopes for analysis of high--temperature chemical-reactor processes. Topics included are: analysis of metal and melt flow in an Al electrolysis bath; analysis of electrolyte diffusion in C materials of an Al electrolysis bath; and diagnostic apparatus for monitoring reaction conditions in rotary kilns.

304. MAMANTOV, G.: Electrochemistry and related studies in molten halides. In: "Molten Salts". Princeton, N.J. 1976. Electrochemical Society, pp. 234-239.

Recent electrochemical and spectroscopic studies in halide melts in which the Lewis acidity can be changed by adjusting the melt composition were studied.

305. POLYAKOV, P.V.; MOZHAEV, V.M.: The thermal conductivity of melts in the sodium fluoride-aluminum fluoride system. Teplofizika Vysokih Temperatur, Vol.13. No.3. May-June 1975. pp. 661-663. /Russian/

The coefficient of thermal conductivity of melts of the $NaF-AlF_3$ system was measured by the method of coaxial cylinders and the results of these measurements are presented graphically for temperatures between 1200° and 1340° K. Variation of the thermal conductivity coefficient with temperature and composition is discussed.

306. ROLIN, M.: Preparation and properties of sintered stannic oxide reference electrodes for the laboratory investigation of fused salt electrolysis. Revue Internationale des Hautes Températures et des Réfractaires, Vol.9. No.4. 1972. p. 17. /French/

Attempts were made to determine the activity of Al_2O_3 in cryolite as a function of its concentration through potentiometry using the pile $Al/Al_2O_3/O$ electrode. Because of the difficulty encountered in reaching equilibrium an electrode was developed using an oxide practically insoluble in cryolite. Sintered stannic oxide proved to be a satisfactory reference electrode.

307. RYTTER, E.; RATLJE, S.K.: Raman spectra of molten mixtures containing aluminum fluoride. Pt. 2. Dissociation of aluminum hexafluoride/3-/ion. Acta Chemica Scandinavica, Ser. A. Physical and Inorganic Chemistry, Vol.A29. No.5. 1975. pp. 565-566.

Raman spectra of Li_3AlF_6-AlF_3 melts at 730°C contain two peaks at 545 ± 10 /AlF_6^{3-}/ and 620 ± 10 cm^{-1} /AlF_4^-/ and two additional peaks at about 220 and 350 cm^{-1}. The dissociation equilibrium constant for AlF_6^{3-} reversible to AlF_4^- + $2F^-$ is 3 x 10^{-2} and the degree of dissociation is 0.24 ± 0.06.

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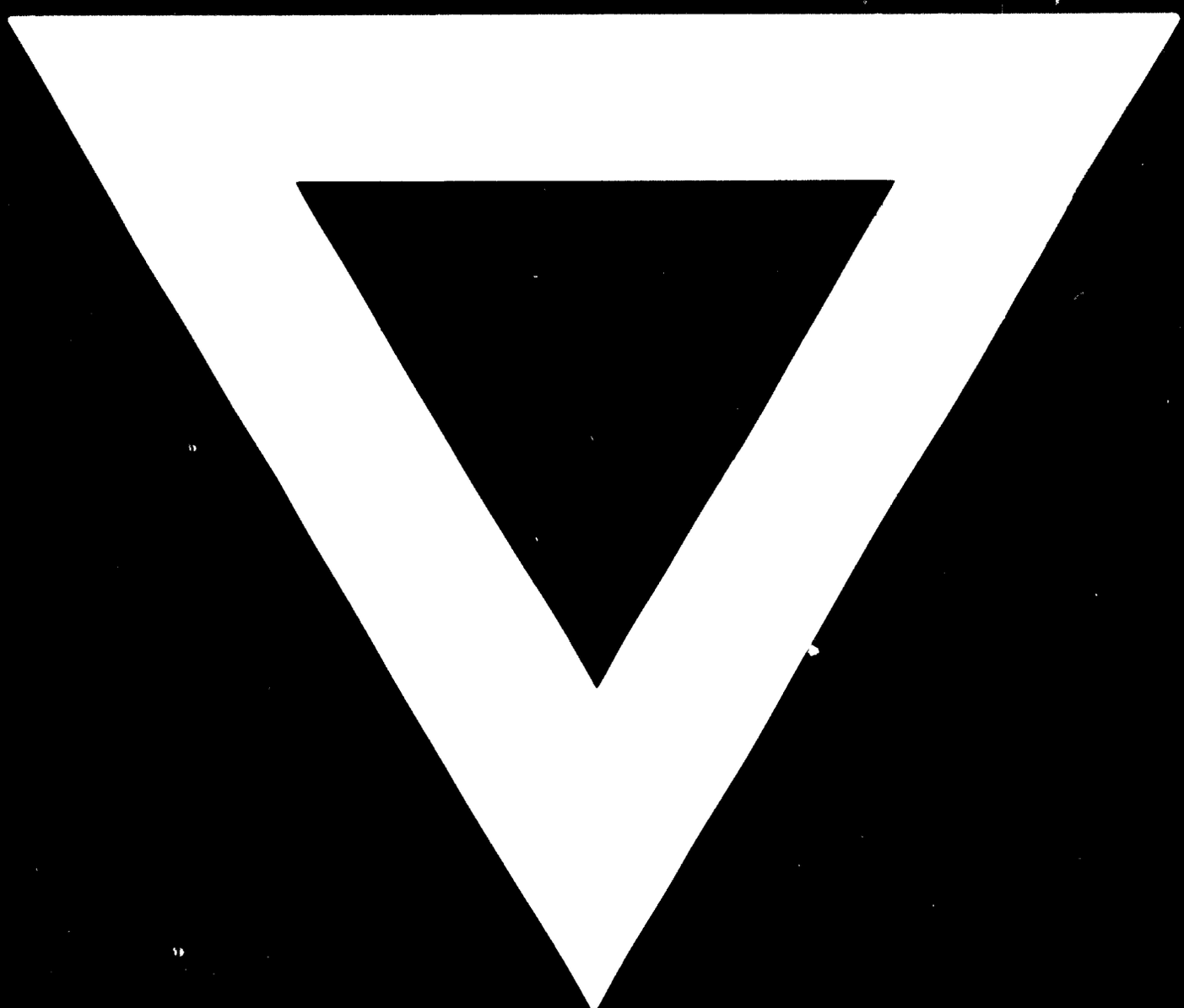

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