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PURPOSE: This book is intended for specialists working in the field of manganese  
technology and related fields.

COVERAGE: This collection of articles presents work accomplished recently in the  
field of manganese electrochemistry. The two main objectives of research were:  
new industrial methods for the preparation of high-purity manganese, and the  
utilization of low-grade ores and manganese wastes. Special attention is given

Card 1/6

Electrochemistry of Manganese, Vol. 1

SOV/1461

to the low-grade manganese ores of the Usinskiye (Uss) deposits situated near the Kuznetsk industrial center. Production of electrolytic manganese is of primary interest to the Georgian SSR which possesses rich manganese ores and an abundance of hydroelectric power. One chapter is devoted to anodic diffusion of manganese and its alloys in different media for the preparation of a variety of compounds of 3, 6, and 7 valent manganese. Results of research in this aspect of manganese technology led to the construction of a plant for the production of potassium permanganate at the Rustavskiy azotnotukovoy zavod (Rustavi Factory of Nitrogen Fertilizers). New electrochemical methods for the production of manganese and permanganate were developed by Academician R.I. Agladze, the Academy of Sciences, Georgian SSR, jointly with collectives of research workers from the Zestafoni ferrosplavnyi zavod (Zestafoni Ferroalloy Plant) and the Rustavskiy Azotnotukovoy Zavod (Rustavi Factory of Nitrogen Fertilizers). Several papers on the cathodic and anodic behavior of manganese and related problems were contributed by the coworkers at the Departments of electrometallurgy and electrochemistry of the Institute of Applied Chemistry and Electrochemistry, Academy of Sciences, Georgian SSR, and the Chair of Electrochemical Technology, Georgian Polytechnical Institute.

Card 2/6

Electrochemistry of Manganese, Vol. 1

SOV/1461

TABLE OF CONTENTS:

Preface	IX
Ch. I. <u>Agladze, R.I., and N.T. Gofman. Nickel and Cobalt in the Hydro-</u> <u>metallurgy of Manganese</u>	3
1. Corrosion and potentials of the manganese electrode	5
2. Corrosion of manganese in the presence of nickel, cobalt, and copper admixtures	15
3. Electrolysis of manganese in the presence of admixtures	25
4. Effect of certain additives on the electrolysis of manganese in the presence of admixtures	53
5. Sulfide method for the removal of nickel and cobalt from electrolyte manganese (Coauthor A.A. Tsintsadze)	69
6. The hydroxide, xanthogenate, and cementation processes for the separation of nickel and cobalt from the manganese electrolyte	107
7. Possible utilization of sulfur sludge obtained as waste in the electrolytic production of manganese	131

Card 3/6

## Electrochemistry of Manganese, Vol. 1

SOV/1461

- Ch. II. Agladze, R.I., and M. Ya. Gdzlishvili. Anodic Diffusion of Manganese and Its Alloys 137
1. Electrode polarization during the anodic diffusion of manganese and its alloys 139
  2. Study of the anodic diffusion of ferromanganese for the purpose of preparing an iron - manganese alloy 169
  3. Preparation of alkali-metal permanganates by means of the anodic diffusion of manganese alloys in sulfate solutions 185
  4. Electrolytic diffusion of manganese alloys 197
  5. Anodic diffusion of the Mn - Cu alloy and some data on the conductance of the system  $\text{Na}_3\text{PO}_4 - \text{NaMnO}_4 - \text{H}_2\text{O}$  217
- Ch. III. Agladze, R.I., and N.I. Kharabadze. Trivalent Manganese 233
1. Polarization of the manganese anode in sulfuric acid solutions 235
  2. Trivalent manganese and the potential of manganese in sulfuric acid solutions 253
  3. Anodic diffusion of manganese in sulfuric acid solutions 279

Card 4/6

Electrochemistry of Manganese, Vol. 1	SOV/1461	
Ch. IV. <u>Agladze, R.I.</u> , and G.K. Norakidze. Thermic Production of Manganese From Its Alloys in a Vacuum		303
1. Production of manganese from its alloys by vaporization in a vacuum		305
2. Effect of carbon on the vaporization of manganese from ferromanganese containing carbon		323
Ch. V. <u>Agladze, R.I.</u> , and N.N. Muchaidze. The Electrolysis of Manganese Chloride and the Purification of Ferromanganese		339
1. Electrolytic production of metallic manganese from chloride solutions		341
2. Electrolytic purification of ferromanganese in chloride electrolytes		355
Ch. VI. <u>Agladze, R.I.</u> , and Ye. M. Pachuashvili. Effect of Certain Admixtures on the Cathodic Deposition of Manganese		375
1. Effect of iron, aluminum, arsenic, antimony, and sodium on the production of electrolytic manganese		377
2. Effect of phosphorus on the production of electrolytic manganese		397
Ch. VII. <u>Agladze, R.I.</u> , and E.M. Ungiadze. Effect of Various Factors on the Cathodic Deposition of Manganese		405
1. Effect of current density on the electrolytic production of manganese		407

Card 5/6

Electrochemistry of Manganese, Vol. 1

SOV/1461

2. Effect of reducing agents, surfactants, and oxidizing agents on the electrolytic deposition of manganese 421
  3. Effect of temperature, electrolyte concentration, and other factors on the eletrolytic production of manganese 439
- Ch. VIII. Agladze, R.I., N.T. Gofman, Ye.M. Pachuashvili, and I. Sh. Gogishvili. Recovery of Manganese From Low Grade Ores by Means of Processes of Hydroelectrometallurgy (Part I. Usinskiye Deposits of Carbonate Ores) 463
1. Recovery of manganese from the Usinkiye ores by leaching 465
  2. Development of the Usinskiye ores by the percolation method 483
- Ch. IX. Agladze, R.I., and G.M. Domanskaya. Anodic Polarization of Manganese in Alkaline Solutions 503

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Card 6/6

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Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 207 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: On the Problem of the Corrosion and the Potentials of a Manganese Electrode (K voprosu o korrozii i potentsialakh margantsovogo elektroda)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 5-14

ABSTRACT: The corrosional and electrochemical behavior of the Mn electrode in an Mn electrolyte (mixture of  $MnSO_4$  and  $(NH_4)_2SO_4$ ) was studied. It is established that the rate of corrosion (according to the evolution of  $H_2$ ) increases by jumps according to the increase in  $(NH_4)_2SO_4$  content with the Mn content remaining constant. The rate of corrosion of Mn and its electrode potential varied considerably with time, while this change increased with an increase in the concentration of  $(NH_4)_2SO_4$ . Meanwhile, the potential showed a considerable tendency towards displacement in the negative sense. The relationships obtained are explained by the formation within

Card 1/2

SOV/137-58-9-19579

On the Problem of the Corrosion and the Potentials of a Manganese Electrode

the system of a series of complex compounds of the  $[Mn(NH_3)_n]^{2+}$  type and the action of  $(NH_4)_2SO_4$  not only as a buffering and complex-compound forming material but also as a solvent for the passivating films on the surface of the metal. The laws obtained permit the conclusion that the electrolytic deposition of Mn is feasible only under the conditions of maximal corrosion.

R.A.

1. Manganese electrodes--Corrosion
2. Complex compounds--Effectiveness

Card 2/2



SOV/137-58-9-19501

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 195 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: On the Problem of Corrosion of Manganese in the Presence Within the Metal of Admixtures of Nickel, Cobalt, and Copper (K voprosu o korrozii margantsa pri nalichii v metalle pri-mesey nikelya, kopal'ta i medi)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN Gruz. SSR, 1957, pp 15-24

ABSTRACT: The corrosion and the electrochemical behavior of short-circuited couples consisting of Mn and metallic admixtures (Cu, Ni, Co) depositing on the surface of Mn in a manganese electrolyte ( $MnSO_4$ ,  $(NH_4)_2SO_4$ ) was studied. In contact with these metals Mn corrodes with a noticeably positive difference effect, but the intensity of the work of all the couples studied is about equal. The work of the couples proceeds under cathode control. The data obtained provide no possibility to attribute the increased reverse solubility of Mn during its electrolysis in the presence of Cu, Ni, and Co to the work of the galvanic couples forming on the surface of the Mn.

Card 1/1

R.A.

1. Cobalt copper-manganese-nickel alloys--Corrosion 2. Manganese--Corrosion  
3. Electrolytes--Applications 4. Manganese--Solubility 5. Manganese  
--Electrolysis

SOV/137-58-8-16659

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 60 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: Electrolysis of Manganese in the Presence of Impurities (Elektroliz margantsa v prisutstvii primesey)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 25-51

ABSTRACT: A study is made of the effect of Ni, Co, and Cu ion impurities upon Mn electrolysis. When Mn is subjected to electrolysis in the presence of impurities, an increase in the intensity of the effect of the impurities is observed according to the sequence  $Cu < Ni < Co$ . The degree of influence of the impurities depends upon the conditions of electrolysis and the bath composition. The quantity of ions of Me impurities in the Mn electrolyte in accordance with which cathodic deposition of Mn in the absence of a reducing environment is possible lies within the limits of 1-2 mg Co/liter, 2-2.5 mg Ni/liter, 15-25 mg Cu/liter. When the contents are higher, the metal does not remain on the cathode under these conditions. With increase in electrolysis time, and with current cd rising with an increase in the pH of the initial

Card 1/2

SOV/137-58-8-16659

Electrolysis of Manganese in the Presence of Impurities

electrolyte (from 6 to 8), the effect of the impurities becomes more intensive and relative current efficiency drops. At a concentration of 80-120 g  $(\text{NH}_4)_2\text{SO}_4$ /liter of electrolyte, a sharp increase in relative current efficiency is observed. When the  $(\text{NH}_4)_2\text{SO}_4$  content rises to 220 g/liter, the current-efficiency curve declines. In the cathode metal, the content of metallic impurity rises with increase thereof in the electrolyte. The bulk of the impurities deposit on the cathode during the first few minutes. When Ni and Co contents are low (not over 1 mg/liter), the external appearance of Mn precipitates is characterized by dark edgings at the ends of the electrode, but if the content is higher there are occasional large areas of dissolution at various points on the cathode. On precipitation Co, Ni, and Cu distribute unevenly along the surface of an electrode covered with Mn.

G.S.

1. Manganese--Electrolysis
2. Manganese--Impurities

Card 2/2

SOV/137-58-8-16658

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 59 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: The Effect of Certain Additives Upon the Electrolysis of Manganese in the Presence of Impurities (Vliyaniye nekotorykh dobavok na elektroliz margantsa v prisutstvii primesey)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 53-68

ABSTRACT: An investigation is made of the possibility of reducing the influence of additives upon the cathode process of Mn deposition by the introduction of additives. The sulfate ion and hydroxylamine have a pronounced positive effect upon the process of electrolysis with impurities. The current efficiency increases significantly. In order for the Mn electrolysis process to go normally in the presence of 2.5-3 mg Co/liter, 0.1-0.5 g  $\text{SO}_3^{2-}$ /liter is required. A higher content of the latter reduces current efficiency and increases the S contents of the metal. Thiourea has a positive effect both upon electrolysis with impurities and upon electrolysis from pure solutions. Introduction of up to 1 g thiourea per liter increases current

Card 1/2

SOV/137-58-8-16658

The Effect of Certain Additives (cont.)

efficiency, but maintainance of the conditioning of the metal in terms of S requires that the amount of thiourea introduced be limited to 0.1-0.3 g/liter.  $\text{SO}_3^{2-}$  and thiourea have no evident effect upon cathode polarization, for all practical purposes.

G.S.

1. Manganese--Electrolysis
2. Manganese--Impurities

Card.2/2

SOV/137-58-8-16657

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 59 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T., Tsintsadze, A.A.

TITLE: Sulfide Methods of Purifying a Manganese Electrolyte of Nickel and Cobalt (Ochistka margantsevogo elektrolita ot nikelya i kopal'ta sul'fidnymi metodami)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 69-105

ABSTRACT: A study is made of the possibility of purifying Mn electrolyte of Ni and Co by Mn sulfides precipitated from individual portions of Mn electrolyte or sulfate by some sulfide precipitant (ammonium or Na sulfides, ammonia water,  $H_2S$ ). The possibility is established of completely purifying the electrolyte of Co by introduction of 20-25 times the stoichiometric ratio of sulfide ion to Co. Raising the temperature to 90-100°C significantly speeds purification and reduces the amount of MnS introduced. The optimum purification pH is 5. The length of time required to agitate the electrolyte depends upon the amount of MnS introduced and upon the temperature. 1 hour is adequate stirring time at 20° and with 25 times the stoichiometric

Card 1/2

SOV/137-58-8-16657

Sulfide Methods of Purifying a Manganese Electrolyte of Nickel and Cobalt

quantity. On heating to boiling and 15 times the stoichiometric ratio, the optimum stirring time is 15 min. Purification from Ni occurs under the same conditions. Electrolysis from a purified MnS electrolyte gave good results. The current efficiencies are in the 55-60% range upon 12 hours of electrolysis. The sulfide S content of the metal is 0.02-0.03%. An investigation was also made of the purification of the electrolyte by sulfides of ammonium and Na. The optimum pH for purification is 4, and purification temperature 20-30° or 100°, with a stirring time of  $\leq 30$  min.

G.S.

1. Electrolytes--Purification
2. Manganese sulfides--Precipitation
3. Electrolyte--temperature factors

Card 2/2

SOV/137-58-9-18773

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 89 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: Hydroxide, Xanthate, and Cementation Cleansing of Nickel and Cobalt From Manganese Electrolyte (O gidrookisnoy, ksantogenatnoy i tsementatsionnoy ochistke margantsevego elektrolita ot nikelya i kobal'ta)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 107-130

ABSTRACT: The results of experiments in the hydroxide cleansing of Mn electrolyte (E) of Ni and Co are adduced, and the conclusion is drawn that this method cannot be recommended for practical use in view of the abundant co-precipitation of  $Mn(OH)_2$  and the significant losses of  $NH_3$ . Literature data are presented on the xanthate method of cleansing Mn and Zn E of Co and Ni. Xanthate properties are examined, and the results of experiments in which the influence of the pH of the solutions, the quantity of xanthates, temperature, duration of stirring, the possibility of clarification of the E after xanthate cleaning, and of removal of excesses thereof from the solution upon xanthate cleaning are

Card 1/2



SOV/137-58-9-18773

Hydroxide, Xanthate, and Cementation Cleansing of Nickel (cont.)

elucidated. The cleansed solution is subjected to a check-out electrolysis. The optimum conditions for the cleansing of Mn E of Ni and Co by xanthate and the consumption of the latter are determined.

N.P.

1. Electrolytes--Purification
2. Manganese hydroxide--Chemical reactions
3. Nickel--Condensation
4. Cobalt--Condensation
5. Xanthic acid esters--Properties

Card 2/2

SOV/137-58-8-16654

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 59 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T.

TITLE: Possibilities of Utilization of Sulfurous Waste Slimes in the Electrolytic Production of Manganese (O vozmozhnosti ispol'zovaniya sernistykh shlamov-otkhodov pri poluchenii margantsa elektrolizom)

PERIODICAL: V sb.: Elektrokhimii margantsa. Tbilisi, AN GruzSSR, 1957, pp 131-136

ABSTRACT: Examination is made of a series of experiments run to determine the possibility of utilization of oxidizing roast followed by leaching to concentrate sulfide cakes. It is found that for the cake composition in question 600°C and 2 hours are the optimum roasting conditions. The concentration of the cake is characterized by bringing the Mn:Ni ratio down from 7 to 2.1 and the Mn:Co ratio from 86 to 35. Thus, for each t metallic Mn it is possible to recover appx. 3.5 kg Ni and 0.25 kg Co.

G.S.

Card 1/1

1. Manganese--Production 2. Manganese conc--Processing 3. Nickel  
--Recovery 4. Cobalt--Recovery 5. Electrolysis

SOV/137-58-10-20475

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 19 (USSR)

AUTHORS: Agladze, R. I., Gdzlishvili, M. Ya.

TITLE: Electrode Polarization on Anodic Dissolution of Manganese and Its Alloys (Elektrodnaya polyarizatsiya pri anodnom rastvorenii margantsa i yego splavov)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 139-167

ABSTRACT: Experiments are run in solutions of  $\text{NaH}_2\text{PO}_4$ ,  $\text{Na}_2\text{HPO}_4$ ,  $\text{Na}_3\text{PO}_4$ ,  $(\text{NH}_4)_2\text{HPO}_4$ ,  $\text{KOH}$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{H}_3\text{PO}_4$ . Anodic and cathodic polarization curves are recorded. The anodes used are electrolytic remelted and non-remelted Mn, low-carbon and carbon Fe-Mn, and Si-Mn. A brass plate is used as the cathode.

1. Manganese alloys--Decomposition 2. Manganese--Decomposition <sup>N. P.</sup>  
3. Electrodes--Polarization 4. Electrolytes--Materials

Card 1/1

SOV/137-58-9-18771

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: Agladze, R. I., Gdzelishvili, M. Ya.

TITLE: ~~A Study of the Process of Anodic Dissolution of Ferromanga-~~  
nese with the Object of Producing a Ferromanganese Alloy  
(Izucheniye protsessy anodnogo rastvoreniya ferromargantsa  
s tsel'yu polucheniya zhelezomargantsevogo splava)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi. AN GruzSSR,  
1957, pp 169-183

ABSTRACT: A study is made of anodic dissolution (AD) of Fe-Mn with formation of cathodic Fe and Mn deposits. The Fe-Mn used in these experiments contained 82.5 Mn and 8.17 Fe. It is found that when AD of Fe-Mn is performed in electrolytes containing Mn, Fe, and  $\text{NH}_4$  salts, cathodic precipitates containing from 2 to 16% Mn are obtained. The composition of cathodic Fe-Mn deposits varies only from 9.37 to 10.53% Mn with variation from 30 to 210 g in contents per liter of solution at a current density of 5 amps/dm<sup>2</sup>, but undergoes no change whatever with increase in duration of electrolysis. When  $cd < 3$  amps/dm<sup>2</sup>, dissolution of Fe-Mn in solutions of  $\text{NH}_3$  sulfate takes the form

Card 1/2

SOV/137-58-9-18771

A Study of the Process of Anodic Dissolution of Ferromanganese (cont.)

of  $Mn^{2+}$  ions, while the Fe goes into precipitation in the form of hydroxides. When  $cd > 3 \text{ amps/dm}^2$ , the Fe-Mn dissolves with formation of ammonium permanganate. With an increase in the duration of electrolysis there is an increase in the current efficiency for ammonium permanganate; 4 hours of electrolysis at  $cd=15 \text{ amps/dm}^2$  yields 46.5% current efficiency. The maximum ammonium-permanganate content of the anolyte is 33.0 g/liter. In order to obtain Fe-Mn alloy on the cathode, AD should be performed at low current densities (up to  $3 \text{ amps/dm}^2$ ). Polarization curves for Mn Fe in solutions of sulfate salts of Mn, Fe, and  $NH_4$  show that the AD of Mn even at relatively high current densities results in the formation of bivalent ions. The AD of Fe proceeds with formation of bivalent ions at negative potential and trivalent at positive potential. The AD of Fe-Mn should be run within the limits of  $3 \text{ amps/dm}^2$   $cd$  if it be desired to obtain products of the lower valences.

1. Iron-manganese alloys--Processing    2. Iron--Separation    L. P.  
3. Manganese--Separation    4. Anodes--Performance    5. Cathodes--Performance  
6. Electrolysis

Card 2/2

SOV/137-58-8-16661

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 60 (USSR)

AUTHORS: Agladze, R.I., Gdzlishvili, M.Ya.

TITLE: Production of Permanganates of Alkali Metals by Anodic Dissolution of Manganese Alloys in Sulfate Solutions (Polucheniye permanganata shchelochnykh metallov anodnym rastvoreniyem splavov margantsa v sernokislykh rastvorakh)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 185-195

ABSTRACT: An investigation is made of a method of production of permanganate by anodic dissolution (AD) of FeMn and SiMn in weakly acid and neutral solutions of sulfate salts. Experiments in the production of Na and K permanganates by AD of Mn alloys in H<sub>2</sub>SO<sub>4</sub> solutions were run in a glass cell, both still and flowing electrolytes being used. Porcelain diaphragms were used in a number of experiments. FeMn rods of the following compositions were tested as anodes (in %): 1) Mn 82.5, Fe 8.1; 2) Mn 79.15, Fe 12.57, C 6.14; 3) Mn 77.18, Fe 14.77, Si 1.18, P 0.35, C 6.47; 4) 99.98 electrolytic Mn, and 5) 99.95 Fe. Fe rods, platelets of stainless steel, and brass tubes were

Card 1/2

SOV/137-58-8-16661

Production of Permanganates of Alkali Metals (cont.)

tested as cathodes. It was found that, 1) in AD of FeMn and SiMn in solutions of sulfate salts, the phenomenon of anode passivation is not observed; 2) in AD of FeMn and SiMn in weakly acid and neutral solutions of sulfate salts, permanganate forms even at low current densities. The optimum conditions for production of K and Na permanganate from FeMn are: Electrolyte - a saturated solution of  $K_2SO_4$  or  $Na_2SO_4$ ; a potential of 5.2-6.5 v in the bath; an anode-cd/cathode-cd ratio of 1:2, a temperature of 18°C. Under these conditions current efficiency is 43%. The optimum conditions for production of K and Na permanganate from SiMn are: Electrolyte - saturated  $K_2SO_4$  or  $Na_2SO_4$  solution; anode cd 7-15 amps/dm<sup>2</sup>; a potential of 7-10 v in the bath. Current efficiency under these conditions is 41.7%.

1. Alkali metal permanganates--Production      2. Manganese alloys--Electrolysis  
3. Sulfate solutions--Properties      4. Electrolytes--Performance

O.B.

Card 2/2

SOV/137-58-9-18772

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 89 (USSR)

AUTHORS: Agladze, R.I., Gdzlishvili, M.Ya.

TITLE: Electrolytic Dissolution of Manganese Alloys (Elektrolitichesko-ye rastvoreniye splavov margantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 197-216

ABSTRACT: This study is performed with the object of determining the function of C in the process of anodic dissolution (AD) of carbon Fe-Mn in solutions of 2-substituted Na phosphate. Alloys of various compositions were subjected to investigation. It is established that on AD of smelted electrolytic Mn, consisting 99.16% of Mn, the best current efficiency in Na-permanganate production, 14.4%, was obtained at a current density of 60 amps/dm<sup>2</sup>. In the AD of Fe-Mn alloys containing from 93.73 to 27.94% Mn, the process of formation of the permanganate ion does not exhibit any improvement. No formation of NaMn was observed at a current density of up to 30 amps/dm<sup>2</sup> in alloys containing 41.64 to 71.10% Fe. In the AD of a Mn-C alloy, the current efficiency for NaMnO<sub>4</sub> is 2.5 times as high

Card 1/2



SOV/137-58-9-18772

### Electrolytic Dissolution of Manganese Alloys

as with Fe-Mn alloys. AD of Mn-Si-C alloy results in the formation of  $\text{NaMnO}_4$  with a current efficiency 4 times as great as with Fe-Mn alloy containing 89.13 and 77.10% Mn. In the AD of an Mn-Cu alloy containing 67% Mn at a cd of 15.3-31.8 amps/dm<sup>2</sup>,  $\text{NaMnO}_4$  is formed with a current efficiency of 26.8%. The slime contains Cu and Mn oxides in the same ratios as in hopcalite, and in this case the anodes remain bright. The AD of Mn alloys in phosphate solutions to obtain  $\text{KMnO}_4$  should be run at a cathode cd 0.8-1.0 amps/dm<sup>2</sup>.

L.P.

1. Manganese alloys--Electrolysis
2. Manganese alloys--Separation
3. Manganese alloys--Test results

Card 2/2

SOV/137-58-9-18863

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 100 (USSR)

AUTHORS: Agladze, R.I., Gdzlishvili, M.Ya.

TITLE: Anodic Dissolution of Mn-Cu Alloy and Some Data on the Electrical Conductivity of the System  $\text{Na}_3\text{PO}_4\text{-NaMnO}_4\text{-H}_2\text{O}$  (Anodnoye rastvoreniye Mn-Cu-splava i nekotoryye dannyye po elektrovodnosti sistemy  $\text{Na}_3\text{PO}_4\text{-NaMnO}_4\text{-H}_2\text{O}$ )

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 217-232

ABSTRACT: Experiments in the production of  $\text{NaMnO}_4$  by anodic dissolution (AD) in  $\text{Na}_2\text{HPO}_4$  solutions of an Mn-Cu alloy containing from 22 to 81% Mn are described. The effect of the current density and of the Mn contents of the alloy upon the AD process are investigated. It is found that: 1) The process proceeds with an anode current efficiency of 9 to 14%, 2) the surfaces of Mn-Cu alloys containing 42-81% Mn become covered with a thin layer of hydroxide on AD, while the surfaces of alloys containing 22-42% Mn remain metallic, and 3) in the AD of alloys containing 68-81% Mn, a slime is produced in which Cu and Mn oxides are in the same relationship as in Hopcalite. Experiments

Card 1/2

SOV/137-58-9-18863

Anodic Dissolution of Mn-Cu Alloy (cont.)

are performed in the production of  $\text{NaMnO}_4$  by AD of ferromanganese. Measurements of the specific conductivity of  $\text{NaH}_2\text{PO}_4$  and  $\text{Na}_2\text{HPO}_4$  solutions of different strengths, of mixtures of solutions of these salts (with and without  $\text{H}_3\text{PO}_4$ ), and of solutions containing a mixture of  $\text{H}_3\text{PO}_4$  and  $\text{NaH}_2\text{PO}_4$ , or 2-64 g  $\text{Na}_3\text{PO}_4$  or 4.7-509 g  $\text{NaMnO}_4$  per liter were made at various temperatures.

N.P.

1. Copper-manganese alloys--Separation
2. Copper-manganese alloys--Electrolysis
3. Anodes--Performance
4. Inorganic substances--Conductivity

Card 2/2

SOV/137-58-10-20476

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 19 (USSR)

AUTHORS: Agladze, R.I., Kharabadze, N.I.

TITLE: Polarization of a Manganese Anode in Sulfuric-acid Solutions  
(Polyarizatsiya margantsovogo anoda v rastvorakh sernoy kisloty)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR,  
1957, pp 235-252

ABSTRACT It is established that: 1) Upon anodic dissolution (AD) of Mn in strong  $H_2SO_4$  solutions, solutions are obtained containing Mn of various levels of oxidation, depending upon the anode current density (cd) and the strength of the electrolyte; 2) the higher the  $H_2SO_4$  strength, the lower the limit of cd at which a point of inflection is obtained on the polarization curve corresponding to the onset of a new process at the anode, and the anodic polarization curves gradually shift toward the more positive potentials, i.e., the Mn anode undergoes more rapid polarization; 3) at low  $H_2SO_4$  normalities (1-5 N), the Mn anode undergoes both electrochemical dissolution and intensive spontaneous dissolution, forming  $Mn^{2+}$  exclusively, this being

Card 1/2

SOV/137-58-10-20476

Polarization of a Manganese Anode in Sulfuric-acid Solutions

accompanied by abundant liberation of  $H_2$ . Under these conditions polarization of the electrodes does not make for a reduction in spontaneous dissolution. The steady potential does not change even when  $cd = 70 \text{ amps/dm}^2$ ; 4) in solutions of 8, 10, and 13N  $H_2SO_4$ , within the range of the  $cd$  studied (up to  $65 \text{ amps/dm}^2$ ), AD of the Mn proceeds in 2 stages: a) The anode dissolves with formation of  $Mn^{+2}$  and  $H_2$ ; b)  $Mn^{3+}$  ions are formed, and  $O_2$  is liberated. In 15, 17, 20, and 22N solutions, the curves of anodic polarization consist of 3 segments, corresponding to the AD of Mn with formation of  $Mn^{2+}$ ,  $Mn^{3+}$ , and  $Mn^{4+}$ . At  $H_2SO_4$  concentrations of up to 22N, the passivation of the anode apparently is phased and conditioned by the blocking effect of the oxide film and the AD products upon the electrode surface. At over 25N, the Mn anode is passive, but its surface remains bright; 5) by their nature, curves I-V are in full correspondence with the polarization curves.

N.P.

- 1. Anodes---Polarization
- 2. Manganese---Decomposition
- 3. Sulfuric acid---Performance
- 4. Electrolytes---Properties
- 5. Electric current---Performance

Card 2/2

SOV/137-58-10-20477

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 19 (USSR)

AUTHORS: Agladze, R.I., Kharabadze, N.I.

TITLE: Trivalent Manganese and the Potential of Manganese in Sulfuric-acid Solutions (K voprosu trekhvalentnogo margantsa i potentsiala margantsa v rastvorakh sernoy kisloty)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 253-277

ABSTRACT: Literature data are employed for a detailed examination of the equilibrium of Mn ions of various degrees of oxidation in acid solutions, for investigation of various Mn<sup>3+</sup> stabilizers, and of the structure of Mn<sup>3+</sup> oxides. An investigation is made of the electrode potential of Mn in solutions of H<sub>2</sub>SO<sub>4</sub> of from normal concentration to the monohydrate. Bibliography: 64 references.

N.P.

1. Manganese ions--Stability 2. Manganese ions--Oxidation 3. Manganese oxide--Structural analysis 4. Sulfuric acid solutions--Properties

Card 1/1

SOV/137-58-9-18769

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: Agladze, R.I., Kharabadze, N.I.

TITLE: ~~Anodic~~ Anodic Dissolution of Manganese in Sulfuric-acid Solutions  
(Anodnoye rastvoreniye margantsa v rastvorakh sernoy kisloty)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 279-301

ABSTRACT: A study is made of the influence of the concentration and temperature of the electrolyte, and also of current density (cd), upon the process of dissolution at the anode (AD) of Mn in strong solutions of  $H_2SO_4$ . It is found that when Mn is subjected to AD, the oxidizing capacity of the electrolyte rises as  $H_2SO_4$  concentration is increased to 22 N and then declines. There is a specific level of solubility of  $Mn^{3+}$  sulfate for each concentration of  $H_2SO_4$ . This concentration declines as the acidity of the solution rises. The excess salt comes down as precipitate. When AD occurs at constant current density, the anode potential shifts in time toward the more positive values owing to the formation of hard-to-dissolve  $Mn^{3+}$  oxide on the

Card 1/2

SOV/137-58-9-18769

Anodic Dissolution of Manganese in Sulfuric-acid Solutions

surface of the electrode. After the maximum has been attained, a reduction in the potential is observed due to the formation of soluble  $Mn^{4+}$  oxide and the effect of the liberated  $O_2$ , which loosens the passivating film of oxide. On AD in 14-16-N solutions of  $H_2SO_4$  at an anode cd of 5-15 amps/dm<sup>2</sup> and 12-25°C, it is possible to obtain a crystalline deposit of  $Mn^{3+}$  sulfate. Crystalline deposits of  $Mn^{3+}$  double sulfates are obtained at 12-30°C. The increase in current density results in an increase in the oxidizing capacity of the solution. AD of Mn in  $H_2SO_4$  to produce  $Mn^{3+}$  should be performed within the limits of cathode cd = -15 amps/dm<sup>2</sup>. Consumption of electrical energy upon AD of Mn with derivation of  $Mn^{3+}$  and  $Mn^{4+}$  sulfates comes to 0.8 kwh/kg.

L.P.

1. Manganese--Separation
2. Anodes--Performance
3. Sulfuric acid--Applications
4. Electrolytes--temperature factors

Card 2/2



SOV/137-59-1-480

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 61 (USSR)

AUTHORS: Agladze, R. I., Norakidze, G. K.

TITLE: Extraction of Mn From its Alloys by Means of Heat Treatment in Vacuum (Vakuumtermicheskoye polucheniye margantsa iz yego splavov)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 303-338

ABSTRACT: Conditions required for the extraction of Mn from its alloys by the method of evaporation in vacuum were studied. During heating of a medium-carbon [mild] Fe-Mn alloy to a temperature of 1250-1280°C at a pressure of 10<sup>-3</sup> mm, 80-90% of Mn contained in the alloy are collected in the condensate; the condensate contains 99.90% Mn. In order to evaporate the Mn contained in Si-Mn, the temperature must be raised to 1350-1450°; 60-70% Mn pass into the condensate, the Mn content of the latter being 99.87%. During the evaporation of carboniferous Fe-Mn the composition of the condensate is almost analogous to the composition of the initial alloys, and the Mn can not be separated. The effect of C on the volatility of Mn in carboniferous

Card 1/2

SOV/137-59-1-480

Extraction of Mn From its Alloys by Means of Heat Treatment in Vacuum

Fe-Mn was studied. It was established that as the C content of the Fe-Mn is increased, the content of the Mn diminishes, whereas the content of Fe, Si, P, and C in the condensate is increased. Pure Mn can not be obtained from a mixture of electrolytic Mn and graphite under vacuum (the C passes into the condensate), whereas a mixture of electrolytic Mn, graphite, and Fe yields a condensate containing Mn, C, and Fe.

L. S.

Card 2/2

SOV/137-58-9-18764

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 87 (USSR)

AUTHORS: Agladze, R.I., Norakidze, G.K.

TITLE: Vacuum Recovery of Manganese From Alloys Thereof (Polucheniye margantsa iz yego splavov ispareniyem v vakuume)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi. AN GruzSSR, 1957, pp 305-321

ABSTRACT: Experiments in the distillation of Mn from medium-carbon Fe-Mn of the following % composition: Mn 83.78, Si 1.84, Fe 13.02, C 1.07, P 0.28, S 0.009, and from Si-Mn of the following composition (in %): Mn 67.7, Si 20.32, Fe 10.97, C 0.95, P 0.047, S 0.005, as well as from carbon Fe-Mn having the following % composition: Mn 79:15, Si 1.46, Fe 12.89, C 6.14, P 0.35, S 0.008, are performed in a laboratory vacuum induction furnace having an MgO or corundum crucible and a condenser consisting of two inverted magnesite crucibles with central holes and placed one upon the other. By heating medium-carbon Fe-Mn to 1250-1280°C at a vacuum of  $10^{-3}$  mm Hg it is possible to drive off 80-90% of the Mn and obtain metal containing 99.9% Mn. The process should be conducted under

Card 1/2

SOV/137-58-9-18764

Vacuum Recovery of Manganese From Alloys Thereof

- conditions of simmering and terminated at a pressure  $\leq 0.3-0.4$  mm Hg. The residue is siliceous Fe-Mn. The distillation of Mn from Si-Mn should be conducted at 1350-1450°C. Under these circumstances, 60-70% of the Mn is driven off and metal of up to 99.87% purity is obtained. The residue is high-silicon Si-Mn. It did not prove possible to distill Mn from high-carbon Fe-Mn. Bibliography: 16 references.

Ye.Z.

1. Manganese--Separation
2. Manganese alloys--Processing
3. Vacuum furnaces  
--Performance

Card 2/2

SOV/137-58-8-16656

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 59 (USSR)

AUTHORS: Norakidze, G.K., Agladze, R.I.

TITLE: Effect of Carbon on Evaporability of Manganese from Carbon-  
aceous Ferromanganese (Vliyaniye ugleroda na ispariyayemost'  
margantsa iz uglerodistogo ferromargantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR,  
1957, pp 323-338

ABSTRACT: Laboratory investigations have established that distillation  
of Mn from Si-Mn and Fe-Mn containing small amounts of C is  
possible, and that metallic Mn of adequate purity may be ob-  
tained in this manner. The higher the C contents of Mn alloys,  
the lower the Mn contents of the condensate and the higher the  
contents of C, Fe, Si, P, and other impurities. When the Fe-  
Mn contains 5-6% C, the distillation product is an alloy of ap-  
proximately the same composition as the starting substance.  
The molten Mn and its fumes react with C to form a carbide  
that is dissolved in the Mn. Therefore, carbonaceous mater-  
ials must not be used in Mn distillation equipment. The hypo-  
thesis is advanced that the results obtained are explained by

Card 1/2

SOV/137-58-8-16656

Effect of Carbon on Evaporability of Manganese (cont.)

the presence in carbonaceous Fe-Mn of a complex carbide of Mn and Fe combining all the C. In this carbide a portion of the C is displaced by impurities (Si, Pb, and S). The complex Mn and Fe carbide, and also the Mn carbide, are distilled simultaneously with the Mn. The sublimate thus obtained oxidize in air with formation of Mn oxides and granules of this carbide. A design has been developed for a high-frequency vacuum furnace for the distillation of Mn and alloys thereof. Bibliography: 7 references.

Ye.Z.

1. Manganese--Vaporization
2. Carbon-manganese-silicon alloys--Processing
3. Carbon-iron-manganese alloys--Processing
4. Vacuum furnaces--Design

Card 2/2

SOV/137-58-9-18768

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: Agladze, R.I., Muchaidze, N.N.

TITLE: Recovery of Metallic Manganese by Electrolysis of Chloride Solutions (Polucheniye metallichesкого margantsa elektrolizom khloristyykh rastvorov)

PERIODICAL: V sb.: Elektrokimiya margantsa, Tbilisi, AN GruzSSR, 1957, pp 341-353

ABSTRACT: The influence of various factors on cathode current efficiency in Mn recovery upon electrolysis of chloride solutions is studied. These include the concentrations of Mn and  $\text{NH}_4\text{Cl}$  in the starting electrolyte (E), the cathode current density, the temperature, the joint effect of temperature and cathode cd, duration of electrolysis, and cathode material. Observations of the composition of, and changes in, the anolyte were made in all the experiments. The optimum conditions for the electrolysis of Mn chloride are determined: Mn contents of the E should be 30-40 g/liter,  $\text{NH}_4\text{Cl}$  60-200 g/liter, cathode cd 4-5 amps/dm<sup>2</sup>, and electrolysis time 6-12 hours. The advantages of the hydrochloric over the sulfuric method are: a) Less

Card 1/2

SOV/137-58-9-18768

Recovery of Metallic Manganese by Electrolysis of Chloride Solutions

possibility of contamination of the precipitate by S, b) higher current efficiency, c) lower voltage on the bath, d) the possibility of recovering a larger quantity of Mn from an identical volume of solution, e) absence of formation of insoluble  $MnO_2$  formations and a simpler regeneration of used E, and f) the possibility of working with higher current densities.

N.P.

1. Manganese chlorides--Electrolysis
2. Manganese--Recovery
3. Electrolytes
4. Electric currents
5. Temperature--Effectiveness

Card 2/2



SOV/137-58-9-18770

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: Agladze, R.I., Muchaidze, N.N.

TITLE: The Electrolytic Refining of Ferromanganese in Hydrochloric-acid Electrolytes (Elektroliticheskoye rafinirovaniye ferromargantsa v solyanokislykh elektrolitakh)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 355-374

ABSTRACT: With the object of eliminating anode precipitation of Cl in the electrolytic recovery of Mn from chloride solutions, the authors investigate the possibility of obtaining metallic Mn by electrolytic refining of carbon-ferromanganese electrodes in chloride solutions. The electrolysis was conducted in a bath with diaphragms, cathodes of stainless steel being immersed in the bath. The level of the electrolyte (E) in the diaphragms was higher than the level of the E in the bath. The E contained 30-40 g Mn/liter, as well as 150-180 g  $(\text{NH}_4)_2\text{SO}_4$ /liter; the pH of the E was 6.7-7.1, the temperature was 20°C, and the anode current density  $\leq 3$  amps/dm<sup>2</sup>. Exhausted and contaminated E was allowed to stand for 2-3 days to remove the Fe, which came down as a

Card 1/2

SOV/137-58-9-18770

The Electrolytic Refining of Ferromanganese (cont.)

precipitate in the form of  $\text{Fe}(\text{OH})_3$ , and then was freed of Ni, Co, and Cu by Mn sulfide or  $(\text{NH}_4)_2\text{S}$ , filtered, adjusted for pH (by addition of HCl or  $\text{NH}_4\text{OH}$ ) and delivered to electrolysis in the cathode space. The current efficiency of Mn yield at the cathode is 64-70%, electric energy consumption is 3.5-3.75 kwh/kg Mn. A balance of materials for refining over an 8-hour period of bath operation is presented, as well as balances for Mn,  $\text{NH}_3$ ,  $\text{Cl}_2$ , and water, and for the consumption of the base materials and electrical energy.

N.P.

1. Carbon-iron-manganese alloys--Electrolysis
2. Electrodes--Performance
3. Hydrogen chloride--Applications

Card 2/2

SOV/137-58-8-16660

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 60 (USSR)

AUTHORS: Agladze, R.I., Pachuashvili, Ye.M.

TITLE: Influence of Iron, Aluminum, Arsenic, Antimony, and Sodium upon the Process of Production of Electrolytic Manganese (Vliyaniye zheleza, alyuminiya, mysh'yaka, sur'my i natriya na protsess polucheniya elektroliticheskogo margantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 377-396

ABSTRACT: The effect of  $Fe^{2+}$ ,  $Fe^{3+}$ , Al, Na,  $Sb^{3+}$ ,  $As^{3+}$ , and  $As^{5+}$  in the electrolyte (E) upon the process of cathodic production of Mn from aqueous solutions containing Mn and  $NH_4$  sulfates is studied. It is established that: 1. When the E contains 0.01 g  $Fe^{2+}$  /liter, the Mn current efficiency drops 10-20% depending upon the pH of the E. An increase in  $Fe^{2+}$  concentration to 0.05 g/liter results in a sharp drop in current efficiency (as much as 0.6%). When the concentration of  $Fe^{2+}$  > 0.1%, alloys consisting chiefly of Fe and containing only a few percent Mn precipitate at the cathode. These alloys may

Card 1/2

SOV/137-58-8-16660

Influence of Iron, Aluminum, Arsenic, Antimony, and Sodium (cont.)

be obtained by electrolysis, with a current efficiency of >40%. 2. Ions of  $Fe^{3+}$  have a considerably smaller influence upon electrolysis than do ions of  $Fe^{2+}$ . When the  $Fe^{3+}$  contents of the E rise from 0.01 to 1.0 g/liter, the Mn current efficiency declines insignificantly (from 64 to 59%). 3. Addition of up to 1 g Al/liter has an insignificant effect in decreasing Mn current efficiency, but at 3 g Al/liter, the entire E is filled with a gelatinous precipitate of  $Al(OH)_3$ , the current efficiency drops 10%, and a small amount of Al is found in the cathodic Mn. 4. As and Sb have a harmful effect upon Mn electrolysis. 0.001-0.05 g As or more per liter results in a sharp decline in current efficiency and impairs the quality of the cathodic Mn. The presence of large amounts of As causes cessation of deposition of metallic Mn, and a black tarnish appears on the cathode. Before the solutions arrive for electrolysis it is necessary to purify them of Sb and As by cementation of the Mn. 5. Na does not have a harmful effect upon cathodic deposition of Mn.

N.P.

1. Manganese--Electrolysis    2. Manganese--Impurities    3. Electrolytes--Performance

Card 2/2

SOV/137-58-9-18767

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: Agladze, R.I., Pachuashvili, Ye.M.

TITLE: The Influence of Phosphorus on the Electrolytical Recovery of Manganese (Vliyaniye fosfora na protsess polucheniya elektroliticheskogo margantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa, Tbilisi, AN GruzSSR, 1957, pp 397-404

ABSTRACT: The influence of P on the process of cathode deposition of Mn from sulfate solutions was investigated. P was introduced into the electrolyte in the form of  $(\text{NH}_4)_2\text{HPO}_4$ ; it was established that as the P content varied from 0.01 to 5 g/liter the current efficiency diminished from 60 to 18%. Upon removal of the Mn phosphate deposit the electrolytic precipitation of Mn proceeds with a normal current efficiency. Tests were performed relative to the leaching of high-phosphorus ferromanganese by  $\text{H}_2\text{SO}_4$ , and the distribution of the P between the precipitate and the solution was established, also the degree of fugacity of the P relative to the acid concentration. The following was established from tests comprising the oxidation of Fe

Card 1/2

SOV/137-58-9-18767

The Influence of Phosphorus on the Electrolytical Recovery of Manganese

in the solutions obtained after leaching: a) At a pH of 1-2 the Fe oxidizes fully and upon further leaching up to a pH of 5 it precipitates in the form of  $\text{Fe}(\text{OH})_3$  which is readily separated by filtration; b) the oxidizing activity of  $\text{MnO}_2$  diminishes significantly with increasing pH. At an electrolyte pH of 3-4 the solutions contain  $\text{Fe}(\text{OH})_2$  which is not retained by the filter.

N.P.

1. Manganese--Electrolysis
2. Manganese--Recovery
3. Phosphorus--Chemical reactions
4. Iron--Oxidation

Card 2/2

SOV/137-58-9-18765

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 87 (USSR)

AUTHORS: Agladze, R.I., Ungiadze, E.M.

TITLE: ~~The Influence of Current Density Upon the Electrolytic Recovery of Manganese~~ (Vliyaniye plotnosti toka na protsess polucheniya margantsa elektrolizom)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 407-420

ABSTRACT: A study is made of the influence of cathode current density (cd) in the electrolytic recovery of Mn from sulfate solutions of Mn and  $\text{NH}_4$  in accordance with the concentration of Mn in the electrolyte (E), the temperature, and the pH of the E. The following is established: 1. From a standard solution containing 150-180 g  $(\text{NH}_4)_2\text{SO}_4$  and 20-25 g Mn/liter having a pH of 7.0-7.2 and a temperature of  $-20^\circ\text{C}$  it is possible to separate Mn only when  $\text{cd} \geq 1 \text{ amp/dm}^2$ . Maximum current efficiency with these solutions was observed when  $\text{cd}$  was 2  $\text{amps/dm}^2$ . 2. A particularly pronounced drop in current efficiency is observed with an increase to  $\text{cd} > 5 \text{ amps/dm}^2$ . 3. The higher the temperature of the E, the higher the  $\text{cd}$  and the lower the

Card 1/2

SOV/137-58-9-18765

The Influence of Current Density Upon the Electrolytic Recovery (cont.)

quantity of Mn at which E will occur. 4. From solutions having an initial pH of 1.7 it is possible to recover Mn when cd is 6-10 amps/dm<sup>2</sup>. 5. At high Mn in the E, an increase in cd has a lower influence upon the indices of the process of electrolysis. 6. The S content in the cathodic Mn increases with increasing cd.

N.P.

1. Manganese sulfates--Processing 2. Manganese--Recovery 3. Electrolytes  
--Performance 4. Electric currents--Density 5. Electrolytes--Temperature factors

Card 2/2



SOV/137-58-9-18766

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 88 (USSR)

AUTHORS: ~~Agladze, R.I., Ungiadze, E.M.~~

TITLE: The Influence of Temperature, Electrolyte Concentration, and Other Factors Upon the Electrolytic Manganese Recovery Process (Vliyaniye temperatury, kontsentratsii elektrolita i drugikh faktorov na protsess polucheniya elektroliticheskogo margantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa, Tbilisi, AN GruzSSR, 1957, pp 439-461

ABSTRACT: Corrections are introduced into the data on the influence of temperature, electrolyte pH, the Mn and NH<sub>4</sub> sulfates contents of the electrolyte, the cathode material, and the duration of electrolysis on the current efficiency in the electrical deposition of Mn. See RZhMet, 1958, Nr 8, abstract 16724.

N.P.

1. Manganese--Recovery
2. Temperature--Effectiveness
3. Electrolyte
4. Electrolysis

Card 1/1

SOV/137-58-10-20478

Translation from: Referativny zhurnal, Metallurgiya, 1958, Nr 10, p 19 (USSR)

AUTHORS: Agladze, R.I., Domanskaya, G.M.

TITLE: Anodic Polarization of Manganese in Caustic Solutions (Anodnaya polyarizatsiya margantsa v shchelochnykh rastvorakh)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 503-514

ABSTRACT: A study is made of anodic polarization (AP) of Mn in solutions of KOH, NaOH, and Na<sub>2</sub>CO<sub>3</sub> of various concentrations, by plotting polarization curves by the compensation method, and also by means of the Vagramyan recording apparatus. The use of the Vagramyan method and apparatus made it possible to discover segments on curves for concentrated KOH and NaOH solutions where O<sub>2</sub> liberation proceeds without formation of Mn<sup>4+</sup>, and also made it possible significantly to diminish the effect of oxidation of the surface on the process of AP and of determining the shape of the curves in the first stages of polarization and oxidation of the anode. This did not prove possible by the method of compensation. Bibliography: 8 references. 1. Manganese ---Polarization 2. Anodes---Oxidation 3. Potassium hydroxides---Performance N.F.  
4. Sodium carbonates---Performance 5. Sodium hydroxides---Performance

Card 1/1

SOV. 137-58-8-17464

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 180 (USSR)

AUTHORS: Agladze, R.I., Gdzeliashvili, M.Ya

TITLE: Effect of Some Colloids on the Process of Electrolytic Deposition of an Iron-manganese Alloy (Vliyaniye nekotorykh kolloidov na protsess elektroliticheskogo osazhdeniya zhelezo-mangantsevogo splava)

PERIODICAL Tr. In-ta metalla i gorn. dela. AN GruzSSR, 1957, Vol 8, pp 163-177

ABSTRACT: Experiments were conducted for the study of the effect of gelatin, agar-agar, dextrin, starch, water glass, and wood glue on the process of deposition of Mn, Fe, and Fe-Mn alloy, also on their structure. The best depositions of Fe-Mn alloy are obtained with the electrolyte containing 0.01-0.03 g/liter gelatin, 0.01 g/liter wood glue, and 0.05 g/liter agar-agar. With an increase of the concentration of additives in the electrolyte the current efficiency of the Fe-Mn alloy decreases.

G.S.

Card 1/1

1. Iron manganese alloys--Electrodeposition
2. Electrolytes--Properties
3. Colloids--Properties

SOV/137-58-8-16655

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 59 (USSR)

AUTHORS: Agladze, R.I., Ungiadze, E.M.

TITLE: The Influence of Reductants, Surface-active Substances, and Oxidizers on the Electrolytic Manganese-precipitation Process (Vliyaniye vosstanoviteley, poverkhnostnoaktivnykh veshchestv i okisliteley na protsess elektroliticheskogo osazhdeniya margantsa)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 421-437

ABSTRACT: An investigation is made of the effect of addition to the electrolyte (E) of  $\text{SO}_2$ ,  $\text{Na}_2\text{SO}_3$ ,  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{Na}_2\text{S}$ ,  $(\text{NH}_4)_2\text{S}$ , soap-root, agar agar, gelatin, and hydroxylamine. upon the process of cathodic deposition of Mn. It is established that; 1) if an E of average purity does not provide a reducing environment, it is not possible to precipitate metallic Mn therefrom by electrolysis, and if the content of reductants is higher than the optimum, they exercise a negative effect; 2) as the quantity of sulfurous reductants in the E rises, there is an increase in the S contents in the cathodic Mn; 3) absence of a reducing medium

Card 1/2

SOV/137-58-8-16655

The Influence of Reductants, Surface-active Substances, (cont.)

in the E or presence therein of negligible amounts of oxidizer result in ex-foliation of the cathode deposit; 4) the yellow anolytes formed when the E is of high acidity contains an oxidizer that may cause peeling of the cathodic metal; 5) addition of certain colloids and surface-active substances facilitates precipitation of Mn at the cathode from contaminated solutions; the effect of the addition of colloids upon E carefully cleansed of impurities upon the process of cathodic precipitation of Mn is insignificant; 6) addition of soaproot to the E has a positive effect in quantities of 0.001-0.1 g/liter. When larger amounts are added, the current efficiency diminishes. Soaproot reduces losses of E from the bath and facilitates removal of Mn deposits from the cathodes.

N.P.

1. Manganese--Electrodeposition    2. Manganese--Oxidation    3. Electrolytes--Properties

Card 2/2

SOV/137-58-8-16663

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 60 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T., Gogishvili, N.Sh.

TITLE: Extraction of Manganese by Leaching of Usa Ores (Iz vlecheniye margantsa iz usinskikh rud vyshchelachivaniyem)

PERIODICAL: V sb.: Elektrokimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 465-482

ABSTRACT: Experiments were run in 1- and 2-stage leaching (L) of Usa Mn chlorite-carbonate ore ( ~30% Mn) with acid anolyte. A study is made of the effect of the degree of comminution of the ore, pulp temperature, and the stoichiometric Mn-ore: H<sub>2</sub>SO<sub>4</sub> and solid-to-liquid ratios upon the degree of recovery of the Mn and the other components of the ore. Single-stage L by a solution containing 75 g H<sub>2</sub>SO<sub>4</sub> yields 71% recovery of Mn from ore in solution when the Mn-ore:H<sub>2</sub>SO<sub>4</sub> ratio is ~1:1 and the solid-to-liquid ratio ~1:9 at a temperature of 20°. The consumption of H<sub>2</sub>SO<sub>4</sub> in extracting Mn in an open-end process is 66% of the amount fed in, and the ore residue after L contains up to 18% Mn. The requirements per t Mn are 6.33 t ore, 2.012 t H<sub>2</sub>SO<sub>4</sub>.

Card 1/2

SOV/137-50-C-13663

Extraction of Manganese by Leaching of Usa Ores

0.388 t  $\text{NH}_3$ , and 19.43  $\text{m}^3$  water. For 2-stage L by solution containing 75 g  $\text{H}_2\text{SO}_4$ /liter, at an Mn-ore: $\text{H}_2\text{SO}_4$  ratio of 1.3.3 in the acid arm and 1:1 in the neutral arm and a solid-to-liquid ratio 1:8, extraction of Mn attains 84% of the starting amount. The residue of ore after L twice contains 4-7% Mn. The degree to which the other components of the ore go into solution virtually doubles the extraction thereof in single-stage L. The requirements per t Mn are 5.3 t ore, 1.883 t  $\text{H}_2\text{SO}_4$ , 0.381 t  $\text{NH}_3$ , and 18.517  $\text{m}^3$  water. The behavior of individual ore components in the resultant caustic solution and in electrolysis is examined, and data are presented on the accumulation thereof in the electrolyte. Electrolysis of purified solutions shows that it proceeds with standard indices and permits extraction of metal of normal quality. Energy consumption is 9.3 kwh/kg Mn.

N.P.

1. Manganese--Production
2. Manganese ores--Processing

Card 2/2

SOV/137-58-8-16662

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 60 (USSR)

AUTHORS: Agladze, R.I., Gofman, N.T., Pachuashvili, Ye.M.

TITLE: Percolation Leaching of Usa Ore (Vskrytiye usinskoy rudy perkolirovaniyem)

PERIODICAL: V sb.: Elektrokhimiya margantsa. Tbilisi, AN GruzSSR, 1957, pp 483-501

ABSTRACT: An investigation is made of percolation leaching of the ores of Usa. When the solution is delivered to the percolator at a rate of 100-150 cc/hr in a single piece of equipment 5 to 22g Mn may be extracted per liter of solution. An increase in temperature to 50-60°C makes it possible to operate at rates 4-5 times as high as at ordinary temperatures with the same extraction of Mn per unit volume of solution. The degree of Mn recovery attains 85-93%. Multi-stage percolation with 3 percolators in tandem showed up to 85% Mn recovery, while ~60% of the amount of H<sub>2</sub>SO<sub>4</sub> introduced was consumed in combining with Mn. Multi-stage percolation with 70 g H<sub>2</sub>SO<sub>4</sub>/liter at room temperature and 250 cc passage of solution per hour revealed extraction of up to 94% of the starting Mn and a concentration

Card 1/2



SOV/137-58-8-16662

Percolation Leaching of Usa Ore

of solutions of up to 30-36 g Mn/liter. The depleted grit contains 4-7% Mn. The solutions emitted from the final percolator contain the following, in g/liter: Fe 3-4, Mg 2-3, Al 1.5-2, Ca 1-2, SiO<sub>2</sub>. 2. Calculations are made of requirements per ton of metallic Mn for 2 varieties of percolation leaching. When solution strength is up to 40 g Mn/liter, the requirements are as follows: Ore 4.48 t, H<sub>2</sub>SO<sub>4</sub> 2.25 t, ammonia 0.4 t, water 18.5m<sup>3</sup>. At solution strengths of up to 30 g Mn/liter, requirements are as follows: 5.45 t ore, 3.021 t H<sub>2</sub>SO<sub>4</sub>, 0.4 t ammonia and 18.9 m<sup>3</sup> water.

G.S.

1. Mangarese ores--Processing 2. Industrial plants--Equipment 3. Industrial plants--Operation 4. Mathematics

Card 2/2

137-58-6-11990

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 114 (USSR)

AUTHORS: Agladze, R.I., Yaroslavskaya, M.A., Gaprindashvili,

TITLE: A Hydrometallurgical Method for Processing of a Sul-  
Antimony-arsenic Ore Containing Noble Metals (Pererabotka  
sul'fidnoy sur'myano-mysh'yakovistoy rudy, soderzhashchey  
blagorodnyye metally, gidrometallurgicheskim sposobom)

PERIODICAL: Tr. in-ta metallurg. i gorn. dela. AN GruzSSR, 1957, Vol 8,  
pp 111-116

ABSTRACT: A process was investigated whereby Sb and As are extracted  
preliminarily by means of alkaline and alkaline-sulfide solu-  
tions. In order to study the process, 100-g batches of ore,  
crushed to a particle size of 2-3 mm, were employed in each  
experiment. The temperature of the pulp was maintained at  
90°C, the liquid-to-solid ratio at 4:1. The process of leaching  
lasted 30 minutes. It was established that a solution of Na<sub>2</sub>S is  
the most effective solvent for sulfidic Sb and As minerals. At  
an Na<sub>2</sub>S concentration of 7-10% and under the condition de-  
scribed above, the extraction of Sb and As (at a temperature of  
80-90°C) reaches 98-100% and 30-40%, respectively. Up to

Card 1/2

137-58 6 11990

A Hydrometallurgical Method for Processing of a Sulfide (cont.)

90-92% of As can be obtained in the form of  $As_2O_5$  by means of heating the tailings from one stage leaching operations to a temperature of 500-600° for a period of 2-3 hours in presence of air. By leaching the ore twice with a solution of  $Na_2S$  and  $NaOH$  up to 50-60% of As can be extracted, the extraction of Sb being equal to 100%. Tailings that do not contain any Sb may be subjected to cyanidation in order to extract the noble metals. The As content in the tailings amount- to 0.15-0.17%.

G.S.

1. Ore Processing
2. Antimony-Separation
3. Arsenic-Separation
4. Solvent action
5. Rare earth elements-Separation
6. Cyanides-Applications

Card 2/2

137-58-6-11993

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 115 (USSR)

AUTHORS: Agladze, R.I., Yaroslavskaya, M.A., Gaprindashvili, V.N.

TITLE: Utilization of Alkaline-sulfide Antimony Solutions Obtained by Leaching of Antimony Ore With a Sodium Sulfide Solution (Ispol'zovaniye shchelochno-sul'fidnykh rastvorov sur'my, poluchennykh vyshchelachivaniyem sur'myanoy rudy rastvorom sernistogo natriya)

PERIODICAL: Tr. In-ta metalla i gorn. dela. AN GruzSSR, 1957, Vol 8, pp 117-126

ABSTRACT: Investigations were performed in order to determine how the quality of Sb and its current efficiency are affected by basic factors of electrolysis. Optimal electrolysis results were obtained under the following conditions: composition of electrolyte prior to the electrolysis (figures in parenthesis represent the composition of the electrolyte after completion of the electrolysis process): 40-30 g/l of Sb (15-10), 40-60 g/l of NaOH (15-10), 40-60 g/l of Na<sub>2</sub>S (80-90), 30-40 g/l of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. temperature, 25-30°C. cathode cd=150-250 a/m<sup>2</sup>; the cathode was made of stainless steel, the anode of lead.

Card 1/2

137-58-6-11993

Utilization of Alkaline sulfide Antimony Solutions (cont.)

At a cd of 150-250 a/m<sup>2</sup> the cathode becomes covered with a layer of 99% pure metallic Sb, the current efficiency being equal to 55-60%. 0.01-0.02% of As separates out at the cathode together with Sb. When ceramic baffles are employed the current efficiency of Sb is 10% greater than in electrolytic baths not so equipped.

G.S.

1. Antimony ores--Electrolysis
2. Electrolytes--Composition
3. Electrolytic cells
- Performance
4. Antimony--Electrical properties

Card 2/2

137-58-6-11995

Translation from Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 115 (USSR)

AUTHORS: ~~Agladze, R. I.~~ Gavrindashvili, V. N., Mzareulishvili, N. V.  
TITLE: Regeneration and Processing of a Spent Electrolyte Obtained  
During the Electrolysis of Alkaline-sulfide Antimony Solutions  
(Regeneratsiya i pererabotka otrabotannogo elektrolita, polu-  
chennogo pri elektrolize shchelochno-sul'fidnykh rastvorov'  
sur'my)

PERIODICAL: Tr. In-ta metalla i gorn. dela. AN GruzSSR, 1957, Vol 8,  
pp 127-134

ABSTRACT:  $Ba(OH)_2$  was employed in regeneration of a spent electrolyte  
while natural pyrolusite and permanganate were used for its  
processing. In the case of  $Ba(OH)_2$  best regeneration results  
(85%-90%) are achieved by means of vigorous stirring of the  
mixture for a period of one hour after it had been heated to a  
temperature of  $100^{\circ}C$ ; the relation:  $Na_2S_2O_3 + Na_2CO_3 / Ba(OH)_2$   
therein is equal to 4. A 100% transformation of  $Na_2S$  into  $NaOH$   
and  $Na_2S_2O_3$  is achieved by means of introducing pyrolusite  
(62.3%  $MnO_2$ ) into the spent electrolyte in an amount equal to  
the ratio  $MnO_2 / Na_2S = 1.5-2$ , as well as by vigorous stirring of  
the mixture over a period of 2 hours after heating it to a

Card 1/2

Regeneration and Processing of a Spent Electrolyte (cont.)

temperature of 90-100°. In order to separate the Sb completely, it is essential that the quantity of CO<sub>2</sub> passing through the solution be greater than is required stoichiometrically.

G.S.

1. Electrolytes--Processing
2. Electrolytes--Regeneration
3. Antimony  
--Electrolysis
4. Barium hydroxides--Applications
5. Permanganates--Applications
6. Manganese dioxides--Applications

Card 2/2

137-58-6-11992

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 115 (USSR)

AUTHORS: Agladze, R.I., Gaprindashvili, V.N., Mzareulishvili, N.V.,  
Lomidze, T.N.

TITLE: Cementation of Antimony With Metallic Precipitants (Tsemen-  
tatsiya sur'my metallicheskim osaditelyami)

PERIODICAL: Tr. In-ta metalla i gorn. dela. AN GruzSSR, 1957, Vol 8,  
pp 135-140

ABSTRACT. Conditions permitting maximum extraction of Sb from solu-  
tions were studied and various other precipitants were investi-  
gated in an effort to replace them with Al. The degree of ex-  
traction of Sb increases as the quantity of metallic Al intro-  
duced into the reacting mixture is increased; it reaches a max-  
imum when the amount of Al is twice as great as the stoichio-  
metric value. Introducing an excess of NaOH into the initial  
solution reduces the duration of the cementation process from  
3 to 1.0-1.5 hours and increases the degree of extraction of Sb  
(up to 94%). In the case of aluminum-silicon the degree of Sb  
extraction increases with increasing temperature and reaches  
its maximum value (65.8%) at 100°C. Maximum extraction of  
Sb (98.8%) is attained at an SB-SiAl ratio of 8. G.S.

Card 1/1

1. Antimony--Separation
2. Solutions--Properties
3. Aluminum--Effectiveness
4. Sodium hydroxide--Effectiveness



137-58-6-11991

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 115 (USSR)

AUTHORS: Agladze, R.I., Gaprindashvili, V.N., Mzareulishvili, N.V.

TITLE: Raw Ammonia Water Dissolves Sulfide Minerals Containing Antimony and Arsenic (Syraya ammiachnaya voda kak rastvoritel' sulfidnykh mineralov sur'my i mysh'yaka)

PERIODICAL: Tr. in-ta metallurgii gorn. dela, AN GruzSSR, 1957, Vol 8, pp 141-146

ABSTRACT: The process of leaching of sulfide Sb and As ores with raw ammonia water was investigated. Up to 90-92% of Sb and 80-85% of As can be extracted in a leaching operation provided the ore is crushed to a particle size of 2-3 mm, the liquid-to-solid ratio is approximately 2:1, and the pulp is vigorously stirred for a period of one hour. As and Sb are separated from ammoniacal solutions in the form of sulfides.

G.S.

1. Ores-Processing 2. Antimony sulfides--Solubility  
3. Arsenic sulfides--Solubility 4. Ammonia-Solvent action

Card 1/1

137-58-6-11994

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 115 (USSR)

AUTHORS Agladze, R.i., Gaprindashvili, V.N., Basmanova, S.N.

TITLE Carbonization of Alkaline Sulfide Antimony Solutions (Karbonizatsiya shchelochno-sul'fidnykh rastvorov sur'my)

PERIODICAL Tr. In-ta metallurgii i gorn. dela. AN GruzSSR, 1957, Vol 8, pp 147-153

ABSTRACT The carbonization process was carried out in a 300-cc reaction vessel. 98% of CO<sub>2</sub> from a tank were introduced through a constant-pressure vessel. The quantity of gas being supplied to the reactor vessel was determined by means of a transparent tube-type flow gage. The carbonization of the solution showed that the reaction of Sb sulfo salt with CO<sub>2</sub> produces an Sb sulfide precipitate and that the compound NaHCO<sub>3</sub> forms in the solution accompanied by the liberation of H<sub>2</sub>S. If the temperature is raised to 100°C the carbonization process terminates in the formation of Na<sub>2</sub>CO<sub>3</sub>. The amount of CO<sub>2</sub> needed for complete carbonization of the solution is a direct function of the concentration of Sb in the solution. Best results were obtained by carrying out the process at room temperature, by increasing

Card 1/2

137-58-6-11994

Carbonization of Alkaline Sulfide Antimony Solutions

the height of the bubbler column to 5 m, by passing the CO<sub>2</sub> at a volumetric rate of 1.0-1.5 l/hr, and by employing solutions the Sb content of which does not exceed 20 g/l.

G.S.

1. Antimony--Carbonization
2. Antimony sulfide--Chemical reactions
3. Carbon dioxide--Chemical reactions

Card 2/2

137-58-6-11978

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 113 (USSR)

AUTHORS: Agladze, R.I., Gaprindashvili, V.N., Mzareuligivili, N.V.

TITLE: Extraction of Arsenic From Sulfidic Arsenous Ores (Polu-  
cheniye mysh'yaka iz sul'fidnykh mysh'yakovistykh rud)

PERIODICAL: Tr. In-ta metalla i gorn. dela. AN GruzSSR, 1957, Vol 8,  
pp 155-161

ABSTRACT: The process of leaching of sulfide As ores with alkaline and alkaline-sulfide solutions was studied, and the possibility of extraction of As from these solutions was investigated.  $\text{Na}_2\text{S}$  solution was employed in the leaching process. 95% of As can be extracted by a 6% solution of  $\text{Na}_2\text{S}$  from a pulp that has been stirred for a period of four hours, while 91.7% can be extracted by a 13-percent  $\text{NaOH}$  solution. Metallic As may be extracted from alkaline-sulfide As solutions by means of carburization. By neutralizing alkaline-sulfide solutions with  $\text{H}_2\text{SO}_4$  the As can be extracted completely in the form of arsenopyrite.

1. Ores--Processing 2. Molybdenum ores--Flotation G.S.  
3. Minerals--Separation

Card 1/1

AGLADZE, R.I., GDZELISHVILI, M. Ya.

Effect of certain colloids on iron-manganese alloy electrolytic precipitation process [in Georgian with summary in Russian]. Trudy Inst. met. i gor. dela AN Gruz. SSR no. 8:163-177 '57. (MIRA 11:8)  
(Iron-manganese alloys--Electrometallurgy)  
(Colloids)

137-58-6-11606

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 52 (USSR)

AUTHORS: Agladze, R.I., Gongliashvili, A.N.

TITLE: Electrolytic Recovery of Iron from Sulfate Solutions (Polucheniye zheleza elektrolizom iz sernokislykh rastvorov)

PERIODICAL: Tr. In-ta metalla i gorn. dela. AN Gruz SSR, 1957, Vol 8, pp 179-191

ABSTRACT: A description is offered of experiments in cathodic precipitation of Fe from  $\text{FeSO}_4$  solution with soluble (steel, iron) and insoluble (Pb) anodes. The experiments studied the influence of current density, the strengths of the  $\text{FeSO}_4$  and  $\text{Fe}_2(\text{SO}_4)_3$ , the acidity of the electrolyte, and the duration of the experiment on the process of electrolysis, the quality of the precipitate, and the unit consumption of electric power. It is established that the current efficiency for Fe from boiling solution containing 200 g  $\text{FeSO}_4$ /liter, is 93-97%; the power consumption per kg cathode-deposited metal is 1.5-2 kwh with soluble and 3-5 kwh with insoluble anodes. The performance of electrolysis with iron anodes, producing a constant increase in the deposit of metal on the cathode, is possible only if partitions

Card 1/2

137-58-6-11606

Electrolytic Recovery of Iron from Sulfate Solutions

are present in the bath and the electrolyte is in constant circulation and is filtered and corrected as to composition. With increasing current density the anode current efficiency diminishes. Regulation of anode current density permits performance of processes of anodic dissolution and cathodic precipitation of Fe with equal current efficiency.

V.K.

1. Iron--Precipitation
2. Electrolytes--Properties
3. Anodes (Electrolytic cell)
- Materials
4. Anodes (Electrolytic cell)--Test results

Card 2/2

137-58-6-11922

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 106 (USSR)

AUTHORS: Agladze, R.I., Arazashvili, I.M.

TITLE: On the Extraction of Alumina from Tkibuli Shale Ash (K vo-  
prosu izvlecheniya glinozema iz zol tkibul'skikh slantsev)

PERIODICAL: Tr. in-ta metalla i gorn. dela AN GruzSSR, 1957, Vol 8,  
pp 217-221

ABSTRACT: Experiments in the burning of shales with the purpose of  
determining the optimum temperature for burning carbon-  
aceous shales to establish the possibility of maximum alumina  
extraction by  $\text{HNO}_3$  were conducted. For carbonaceous shales,  
the optimum temperature of combustion is 450-550°C. Leach-  
ing of the resultant ash is done with 30%  $\text{HNO}_3$  at 50°. The  
optimum composition of the mix is one in which the molar ratio  
of  $\text{Na}_2\text{CO}_3:\text{Al}_2\text{O}_3 = 1.1$  and that of  $\text{CaCO}_3:\text{SiO}_2 = 2$ .

G.S.

1. Aluminum ores--Effectiveness
2. Aluminum ores--Processing
3. Rock--Analysis

Card 1/1



AGLADZE, R.I., BABITSKIY, G.B.

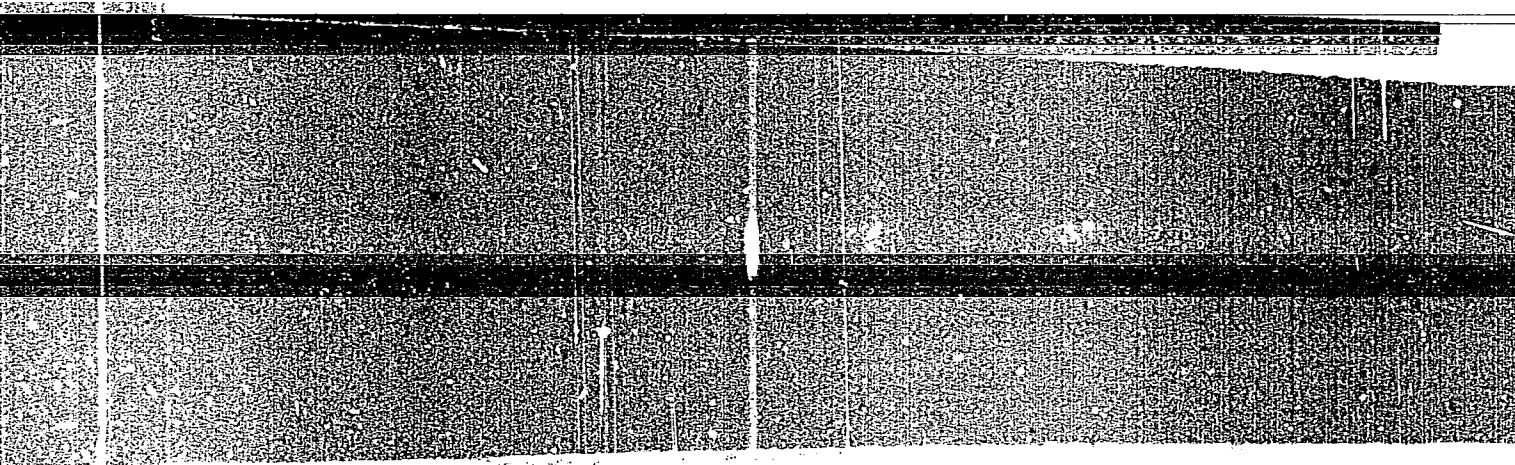
Atmospheric nitrogen fixation by means of electric discharges.  
Trudy Inst. met. i gor. dela AN Gruz. SSR no. 8:223-250 '57.

(MIRA 11:8)

(Nitrogen--Fixation)  
(Electric discharges through gases)

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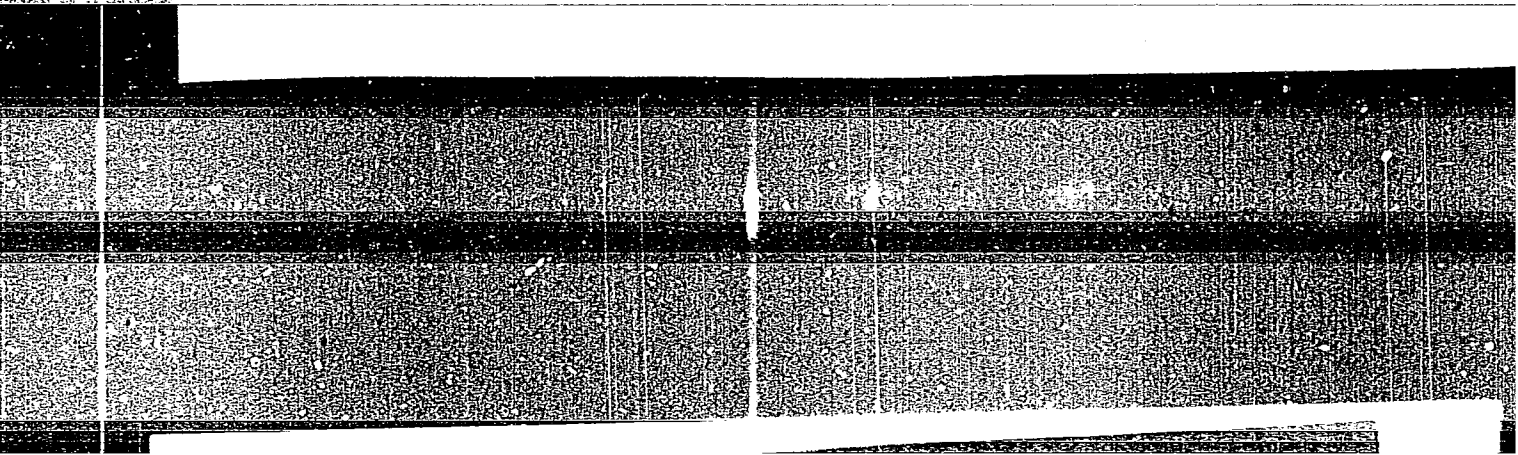


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... in the Higher Schools of the Georgian SSR

5-12-2/27

training of scientific workers. In the field of experimental physics Professor D.B. Gogoberidze achieved interesting results in the investigation of crystal twinning and deformations. In the field of chemistry Professor P.G. Melikishvili investigated the chemical composition of agricultural products. Professors I.G. Kutateladze, P.A. Kometiani and V.E. Gvaladze dealt with the matters of medical raw material, biochemistry and alcoholic fermentation. The chair of geology and mineralogy comprises 16 doctors, the most outstanding scientists are Professors A.I. Dshanelidze, L.Sh. Davitashvili and A.N. Dzhavakhsivili. Scientific work in the field of agriculture is conducted at various institutes, outstanding scientists in this section are: T.K. Kvaratskhelia, Actual Member of the Georgian Academy of Sciences, V.L. Menabde, D.P. ...

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7  
Anodic solution of manganese  
Permanganate

Chemically pure  $KMnO_4$   
sture contg Mn

10-12 g. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and at 18-20° this increased to 30-5  
g/l. (stdn.). After the electrolyte became saturated with K<sub>2</sub>  
MnO<sub>4</sub> crystals of KMnO<sub>4</sub>.

SOV/78-3-10-21/35

AUTHORS: Agladze, R. I., Topchiashvili, L. I., Mokhov, V. M.

TITLE: Phase Transformation in the System Manganese-Copper-Iron  
(Fazovyie prevrashcheniya v sisteme marganets-med'-zhelezo)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1958, Vol 3, Nr 10, pp 2354-2360  
(USSR)

ABSTRACT: In the present paper the action of iron on the structure and properties of alloys obtained from manganese and copper was investigated. The alloys in the manganese corner of the ternary system manganese-copper-iron were investigated within the concentration range of 50-100% Mn. The initial materials used for the production of these alloys had a purity of 99,6%. The investigations of the alloys dealt with the microstructure, electric resistance and dilatometric analysis. In the alloys containing 60-90% manganese and the same quantities of copper and iron, the microstructure corresponds to the eutectoid type. This structure was probably caused by the decomposition of the  $\beta$ -manganese phase. A dendritic structure occurs in alloys containing 50-60% manganese, after their gradual cooling. The investigations of the microstructures in the manganese corner of

Card 1/2



SOV/78-3-10-21/35

Phase Transformation in the System Manganese-Copper-Iron

the ternary system show that an addition of iron does not stabilize the  $\gamma$ -solid solution. All alloys containing 50-100% manganese are two-phase mixtures of  $\gamma + \alpha$  Mn. The electric resistance was measured by means of the potentiometer of the PPTV -1 type. The results of the determinations of the electric resistance are presented in table 3. The transformation  $\alpha \rightarrow \beta$  manganese in the binary alloy Mn-Cu could not be found by dilatometric investigations. However, a transformation of that kind can easily be observed by a dilatometric investigation of the binary alloy Fe-Mn. It follows from these investigations that an addition of iron to manganese alloys does not exert any influence upon the stabilization of the  $\gamma$ -solid solution, but causes the intense decomposition of this phase on a decrease in temperature under the formation of the  $\alpha$ -manganese phase, due to which the alloys become cracky. There are 5 figures, 3 tables, and 6 references, 3 of which are Soviet.

ASSOCIATION: Institut prikladnoy khimii i elektrokhemii Akademii nauk  
Gruzinskoy SSR (Institute of Applied Chemistry and Electro-  
chemistry of the Academy of Sciences, Gruzinskaya SSR)

Card 2/2

SUBMITTED: July 22, 1957

SOV/78-3-11-18/23

AUTHORS: Topchiashvili, L. I., Agladze, R. I., Mokhov, V. M.

TITLE: The Investigation of the Alloys of the System Manganese-Copper-Cobalt (Issledovaniye splavov sistemy marganets-med'-kobal't)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1958, Vol 3, Nr 11, pp 2537-2544 (USSR)

ABSTRACT: The system manganese-copper-cobalt and above all ternary systems enriched with manganese were investigated. Purest electrolytical manganese, copper, and cobalt with a purity of 99,15% were the initial materials for the production of the alloys. The microstructure, hardness, electric resistance, and the dilatometric analysis of the samples were investigated. From the investigation of the microstructure the authors concluded that the addition of cobalt does not stabilize the  $\delta$  and heat resistive solution. The manganese alloys of the ternary system manganese-copper-cobalt (up to 50% manganese) represent bi-phase mixtures ( $\delta'$  +  $\alpha$ Mn). The hardness of the alloys showed that the  $\delta'$ -phase is not stabilized in the manganese-cobalt-alloys with less than 50% cobalt. In alloys with 65 and 70% manganese and 10% cobalt an unimportant reduction of the hardness takes place. In the

Card 1/2

SOV/78-3-11-18/23

The Investigation of the Alloys of the System Manganese-Copper-Cobalt

case of a further increase in the cobalt content the hardness is increased and the alloys become extremely solid and brittle. The determination of the electric resistance was carried out by means of the potentiometer of the type PPTV -1. Comparatively higher values of the electric resistance occur in alloys with 20-30% cobalt. These alloys are of no practical interest, since they are not plastic. The dilatometric investigations in the ternary systems show that an intermediate phase occurs in alloys with 5-10% cobalt which is characterized by an anomalous expansion in the temperature range of 350-650°C. There are 6 figures, 4 tables, and 5 references, 3 of which are Soviet.

ASSOCIATION: Institut prikladnoy khimii i elektrokhemii Akademii nauk Gruzinskoy SSR (Institute of Applied Chemistry and Electrochemistry, AS Gruzinskaya SSR)

SUBMITTED: July 22, 1957

Card 2/2

AGL ADZE, R. I.

8.3

PHASE I BOOK EXPLOITATION SOV/3462

Akademiya nauk Gruzinskoy SSR. Institut prikladnoy khimii i elektrokhimii

Gidroelektrometallurgiya khroma; sbornik rabot (Hydroelectrometallurgy of Chromium; Collection of Works), Tbilisi, 1959. 261 p. 1,000 copies printed.

Ed.: N.T. Gofman; Ed. of Publishing House: L.N. Sarkisyan; Tech. Ed.: A.R. Todua.

PURPOSE: This book is intended for metallurgists.

COVERAGE: This collection of papers deals with the problem of obtaining high-purity chromium and the problem of producing pure raw materials from which the metal itself is obtained. The investigations reported in this volume were conducted between 1947 and 1957 at the Institut prikladnoy khimii i elektrokhimii AN Gruzinskoy SSR (Institute of Applied Chemistry and Electrochemistry, Academy of Sciences Gruzinskaya SSR). The most detailed studies in the collection are those dealing with the electrolysis of sulfate solutions and with methods of obtaining raw materials for the process. It is  
Card 1/9

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

claimed that more than a decade of investigation, testing of flowsheets and electrolytic-tank designs, utilization of Soviet and non-Soviet data, and reverification of published results obtained at the pilot plant of the U.S. Bureau of Mines have led to the development of a definite, and to some extent original, method of obtaining high-purity chromium. Choice of a simple, economical flowsheet required the study of methods for obtaining and purifying compounds of trivalent chromium. The most acceptable method, technologically, has proven to be a two-stage refining of ferrochrome. It is described in the Introduction by R.I. Agladze. Compounds of hexavalent chromium are obtained in the first stage by direct electrochemical dissolution of carbon-containing ferrochrome; in the second stage, electrolysis of the chromium salts, reduced to the trivalent state, is carried out. The method is considered significant in view of the possibility it affords of using not only standard ferrochrome, but also ferrochrome with a high content of impurities and a low chromium content. This feature makes it feasible to use low-grade chrome ores. Studies are made of the anodic dissolution of ferrochrome in sulfate, carbonate, alkaline, ammoniacal, and chromate solutions. The following methods of reducing hexavalent chromium

Card 2/9

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

compounds are investigated: the electrochemical method, the action of sulfur-containing substances, and the action of materials containing cellulose. Also investigated are methods of purifying the chromium compounds of iron, the principal contaminant, by fractional precipitation of hydroxides, direct precipitation of iron hydroxide, or solution of ferrochrome in alkaline, carbonate, and other electrolytes. One of the possible processes of obtaining high-purity chrome hydroelectrometallurgically is presented with an accompanying flowsheet. The principal components are chromium sulfate, ammonium sulfate (or chrome ammonium alum), and a certain quantity of bivalent chromium ions, which form during the electrolytic process and whose preservation at a definite concentration is necessary for stabilizing the process. Carbon-containing ferrochrome is used as the raw material for the production of chrome-ammonium alum. Ammonium bichromate is obtained by anodic dissolution of ferrochrome in reusable solutions at a definite pH value. Iron hydroxide and other insoluble residues are filtered off. Industrial water is used for preparing new portions of the electrolyte. The electrolyte, a solution of ammonium bichromate or a mixture of bichromate and chromate, is reduced in the presence of sulfuric acid with iron filings

Card 3/9

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

or other reducing agents to the complete conversion of bichromate to chromium sulfate. The electrolyte is then transferred to crystallizing tanks for crystallization of the chrome ammonium alum. A small quantity of catholyte, containing bivalent chromium ions, is added to the crystallizing tanks to speed up crystallization. The acidic mother liquor is returned to the section for the reduction of bichromate, and the chrome ammonium alum is dissolved for the feeding of the catholyte of the chromium tanks. An anolyte, a mixture of chromic and sulfuric acids, is also added to the section for reducing, where it is reactivated. A trial run on an industrial scale has shown that the process may successfully compete with the production of chromium by aluminum reduction and demonstrated the high quality of the product. The studies in this collection and the proposed method of producing high-purity chromium are considered by the staff of the Institute of Applied Chemistry and Electrochemistry as just one stage in their work. Investigations of other methods will be reported in a later volume. The investigators are studying the possibility of obtaining chromium in a single-stage electrolysis involving solution of ferrochrome and cathodic precipitation of the pure metal in a single tank. For this purpose chloride and chromic acid electrolytes are being considered, the latter

Card 4/9

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

being of particular interest since their application results in negligible co-precipitation of iron. No personalities are mentioned. There are 162 references: 92 Soviet, 57 English, 9 German, and 4 French.

TABLE OF CONTENTS:

Introduction

V

OBTAINING CHROMIUM COMPOUNDS FROM FERROCHROME

I. Electrochemical Methods of Obtaining Chromium Compounds

Agladze, R.I., T.V., Ionatamishvili, and S.N. Basmanova. Anodic Dissolution of Ferrochrome in Solutions of Sodium Carbonate and Caustic Soda

3

Gvelesiani, Dzh. F., L.L. Rubesh, R.I. Agladze, and T.V. Ionatamishvili. Obtaining Chromium Sulfate by Reduction of Compounds of Hexavalent Chromium

9

Agladze, R.I., and T.V. Ionatamishvili. Obtaining Bichromate by Card 5/9



Hydroelectrometallurgy of Chromium (Cont.)	SOV/3462
Anodic Dissolution of Ferrochrome in Alkaline and Chromate Solutions	21
Agladze, R.I., T.V. Ionatamishvili, Dzh. F. Gvelesiani, and L.L. Rubesh. Production of Ammonium Bichromate and Chrome Ammonium Alum From Ferrochrome	33
Ionatamishvili, T.V. Resistivity of Electrolytes in the Anodic Dissolution of Ferrochrome	51
Ionatamishvili, T.V. Potentiometric Investigation of Chromate Solutions	57
Agladze, R.I., and N.V. Mzareulishvili. Anodic Dissolution of Ferrochrome in Sulfuric Acid Solutions	63
II. Chemical Methods of Obtaining Chromium Compounds	
Lutsenko, N.G., R.I. Agladze, and T.V. Ionatamishvili. Separation of Sulfates of Chromium and Iron by Fractional Crystallization	75
Mzareulishvili, N.V., and R.I. Agladze. Separation of Sulfates of Chromium and Iron by Fractional Crystallization	83
Basmanova, S.N. Production of Anhydrous Chromium Chloride Card 6/9	99

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

Ionatamishvili, T.V. Separation of Compounds of Chromium and Iron by Fractional Precipitation of Hydroxides 107

PRODUCTION OF METALLIC CHROMIUM

I. Production of Metallic Chromium by Electrolysis of Its Hexavalent Compounds

Berezovskaya, T.A. Production of Metallic Chromium From Solutions of Chromic Anhydride 119

Berezovskaya, T.A. Production of Metallic Chromium From Polychromates 129

II. Production of Metallic Chromium by Electrolysis of Chlorides

Gofman, N.T., D.I. Dzhaparidze, and T.I. Lezhava. Electrolysis of Chromium Chloride. Report I. Some Data on the Behavior of Chromium Chloride Solutions During Electrolysis 139

Gofman, N.T., T.I. Lezhava, and D.I. Dzhaparidze. Electrolysis of Chromium Chloride. Report II. Production of Metallic Chromium. Card 7/9

Hydroelectrometallurgy of Chromium (Cont.)	SOV/3462	
ium		149
III. Production of Metallic Chromium From Chromium Iodide		
Basmanova, S.N. The Problem of Obtaining High-Purity Chromium		167
IV. Production of Metallic Chromium by Electrolysis of Sulfates		
Gvelesiani, Dzh. F., and R.I. Agladze. Some Properties of Sulfuric Acid Electrolytes Used for the Production of Electrolytic Chromium		179
Ionatamishvili, T.V., and L.L. Rubesh. Effect of Certain Sulfur Compounds on the Process of Producing Electrolytic Chromium		191
Agladze, R.I., T.V. Ionatamishvili, D.A. Bogveradze, and R.A. Mindodashvili (Deceased). The Problem of Obtaining Carbon-Free Chrome and Chrome Alloys by Electrolysis		201
Agladze, R.I., and Dzh. F. Gvelesiani. Production of Electrolytic Chrome From Ferrochrome		221
Card 8/9		

Hydroelectrometallurgy of Chromium (Cont.)

SOV/3462

Bibliography

255

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Card 9/9

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5-17-60

KASHAKASHVILI, N.V., prof., otv.red.; GAMBASHIDZE, R.B., kand.nauk, otv.  
red.; AGLADZE, R.I., prof., red.; BERIDZE, V.M., prof., red.;  
GIGINEYSHVILI, K.M., red.; GONLASHVILI, T.B., kand.nauk, red.;  
TAVADZE, F.I., prof., red.; KKKELIDZE, M.A., doktor nauk, red.;  
MIKELADZE, G.Sh., kand.nauk, red.; NADIRADZE, Ye.M., kand.nauk,  
red. q

[Metallurgical terminology] Metallurgicheskaya terminologiya.  
Otv.red.N.V.Kashakashvili i R.B.Gambashidze. Tbilisi, 1959.  
324 p. (MIRA 13:2)

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(Russian language--Dictionaries--Georgian)  
(Georgian language--Dictionaries--Russian)

SOLYARSKIY, A. P.

PHASE I BOOK EXPLOITATION SOV/2216

Sveshchaniye po elektrokimii. 4th, Moscow, 1956.

Trudy...; Izborniki (Transactions of the Fourth Conference on Electrochemistry; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2,500 copies printed. Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.

Editorial Board: A. M. Frumkin (Resp. Ed.) Academician, G. A. Yesin, Professor, S. I. Zhdanov (Resp. Secretary), B. M. Kabany, Professor, S. I. Zhdanov (Resp. Secretary), B. M. Kabany, Professor, Ya. M. Koltyrkin, Doctor of Chemical Science, Yu. L. Loshakov, P. D. Lukovtsev, Professor; Z. A. Solov'yeva, Doctor, Professor; and G. M. Florianovich; Ed. of Publishing House: N. O. Yegorov; Tech. Ed.: T. A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry. CONTENTS: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and galvanic processes in metal electrodepositon and industrial electrolysis. Abridged discussions are given at the end of each division. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

AGLACIE, R. J. Hydrometallurgical Production of Manganese and Chromium 493

Titov, P. J., and Z. A. Tubyshkina (Institut tevtromH metallovedeniya imeni M. I. Kalinina-Institute of Nonferrous Metals and Gold in the U.S.S.R., Kalinin). Cathodic Process During the Deposition of Tin From Halogen Electrolytes 498

Kolukarov, M. M. (Permskiy Gosudarstvennyy universitet-Perm State University). Hydrogen Absorption by Steel Cathodes in the Metal Electrodeposition Process 502

Zhoriglan, V. M., and B. Ya. Kaznachey. Electrodeposition of Hard Magnetic Alloys 506

Kudachev, L. I., and A. Kh. Matik (Pedagogicheskiy institut imeni I. I. Mechnikova, Kharkov-Pedagogical Institute of Soviet Trade) Mechanism of Electrolytic Deposition of Metals Onto a Passivated Surface 512

AGLADZE, R. I.

5(4)  
 PHASE I BOOK EXPLOITATION 507/2216  
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PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in electrochemistry.  
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Teyzhanov, G.A., A. I. Chernikovskaya, and A. I. Zaslavskiy (Institut khimii AN USSR-Institute of Chemistry, Academy

Card 21/3\*

..... of Sciences, USSR). Separation Coefficient: During Simultaneous Electrodeposition of Metals of the Iron Group	536
Zaslavskiy, D. E., and M. Ye. Meshkova. Cathodic Processes During the Separation of Zinc and Hydrogen at Electrodes of Other Metals	541
Shluger, M. A. Role of a Side Anion in the Process of Chromium Electrodeposition	547
Yuskov, V. A. (Lesotekhnicheskii institut Arkhangel'sk. Institut for Forest Technology, Arkhangel'sk). Neutralization of Metallic Ions at Macrodistances from the Cathode	550
Chiznikov, D. M., and L. V. Bliznitskaya. Influence of Peric Acid on the Cathodic Polarization of Micks in Sulfuric Acid Solutions	553

Card 22/3\*

80773

S/137/60/000/03/03/013

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No 3, pp 99-100,

# 5273

18.3100

AUTHORS:

Agladze, R.I., Ionatamishvili, T.V., Bogveradze, D.A.,  
Mindodashvili, R.A.

TITLE:

On the Problem of Obtaining Carbonless Chromium Alloys and  
Chromium by Electrolysis 1

PERIODICAL:

V sb.: Gidroelektrometallurgiya khroma. Tbilisi, AN GruzSSR,  
1959, pp 201 - 219

TEXT:

The authors studied the effect of Fe and Ni concentration in the electrolyte on the current efficiency, the amount and composition of the cathode deposit of a carbonless Cr-alloy; they also investigated the possibility of purifying the electrolyte from Fe and Ni by pre-electrolysis (forelektroliz) whereby initially a rich Cr alloy is being obtained and then, pure Cr is produced proportionally to the reduced concentration of substances introduced in the electrolyte. A mixture of Cr, Ni (100 g/l) and NH<sub>4</sub> (100 g/l) X

Card 1/3



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s/137/60/000/03/03/013

On the Problem of Obtaining Carbonless Chromium Alloys and Chromium by Electrolysis

sulfates was used as the initial electrolyte. The temperature was 35 - 45°C. The experiments were carried out in cells with diaphragms. It is shown that in purifying the electrolyte from Fe by pre-electrolysis a carbonless alloy rich in Cr is obtained containing 13.5 - 2% Fe. The efficiency for alloy current is 32 - 40%. The Fe-content in the cathode deposit depends on the Fe concentration in the electrolyte, the acidity of the catholyte and the time of electrolysis. To obtain electrolytic Cr, containing  $\leq 0.5\%$  Fe, the concentration of the latter in the electrolyte  $\leq 0.1$  g/l; for the deposition of non-ferrous Cr or Cr with Fe traces it is 0.02 g/l. The presence of Fe in the electrolyte improves considerably the appearance of the cathode Cr deposit. The presence of Ni in Cr-electrolyte reduces sharply the current efficiency for Cr and entails the blackening of the cathode deposit; electrochemical treatment of the electrolyte does not improve the process characteristics. In the presence of Fe ions, changes in the Ni concentration in the electrolyte within the limits of 0.1 - 1.0 g/l do not impair the characteristics of the electrolytical process and do not affect the Ni content in the cathode deposit, X

Card 2/3

AGLADZE, N.

PHASE I BOOK EXPLOITATION

SOV/5277

Akademiya nauk Gruzinskoy SSR. Institut prikladnoy khimii i elektrotekhniki.

Trudy, t. 1 (Academy of Sciences of the Georgian SSR. Institute of Applied Chemistry and Electrochemistry. Transactions) v.1. Tiflis, 1960. 186 p. Errata slip inserted.

Personalities cannot be established in Georgian writing.

PURPOSE: This collection of articles is intended for mineralogists, metallurgists, and mining specialists.

COVERAGE: The collection contains articles concerning recent research on methods for treating antimony- and arsenic-bearing ores and carbonate ores of manganese. Research on the electrochemical properties of certain ores and their electrodeposition is also discussed. The collection includes

Card 1/8<sub>2</sub>

AGLADZE, N.I.; GAPRINDZILI, V.I.

Hydrometallurgical processing of antimony ore from the Zopkhitskoye deposit. Trudy Inst. prikl. khim. i elektrokhim. An Gruz. SSR no. 1:33-50 '80.

(NINA 14:2)

(Georgian--Antimony)

AGLADZE, R.I.; GAPRINDASHVILI, V.N.; BASMANOVA, S.N.

Preparation of arsenic trisulfide. Trudy Inst. prikl. khim. i  
elektrokhim. AN Gruz. SSR no. 1:125-130 '60. (MIRA 14:2)  
(Arsenic sulfide)