

KUDRYAVTSEV, N.T.; TYUTINA, K.M.; MIKHAYLOV, N.I.; GLAZUNOVA, V.K.

Causes of the formation of dark spots on the surface of zinc  
plated parts. *Izv.vys.ucheb.zav.; khim.i khim tekh.* 3 no.1:  
166-169 '60. (MIRA 13:6)

1. Kafedra elektrokhemii Moskovskogo khimiko-tekhnologicheskogo  
instituta imeni D.I. Mendeleyeva.  
(Zinc plating)  
(Zinc--Corrosion)

S/153/60/003/005/010/016  
B013/B058

AUTHORS: Bek, R. Yu., Kudryavtsev, N. T.

TITLE: Effect of Alternating Current in Electrodeposition of Zinc, Lead, and Tin From Alkaline Electrolytes

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya, 1960, Vol. 3, No. 5, pp. 898-901

TEXT: The effect of superposition of a.c. over d.c. during electrodeposition of zinc, lead, and tin from alkaline electrolytes was studied here. The following electrolytes were used: 1) 0.25 N Zn, 2.5 N NaOH<sub>summ</sub> without addition; 2) 0.25 N Zn, 2.5 N NaOH<sub>summ</sub>, 0.5 g/l Sn (calculated per metal); 3) 0.8 N Pb, 4 N NaOH<sub>summ</sub>, 50 ml/l glycerin; 4) 80 g/l Na<sub>2</sub>SnO<sub>3</sub>, 10 g/l NaOH<sub>free</sub> without additions. The temperature of all solutions was 50°C. Zinc and tin were deposited on polished steel, lead on polished brass. The experiments showed that the development of spongy growth on zinc electrolytes may be entirely prevented without additions by

Card 1/3

Effect of Alternating Current in Electrodeposition of Zinc, Lead, and Tin From Alkaline Electrolytes

S/153/60/003/005/010/016  
B013/B058

applying a.c. with a frequency of 20-300 cycles and at a higher current density than that of d.c. A smooth, semibrilliant deposit with characteristic "parquet" structure was ascertained at a current density ratio between a.c. and d.c.  $D_{\sim}/D_{-} = 2 - 3$ , and a frequency of 20-70 cycles. The crystal boundaries become less distinct at  $D_{\sim}/D_{-} > 10$ . Signs of spongy growth appear at frequencies of 300-500 cycles. The effect of a.c. disappears at an addition of tin (0.5 g/l) or lead (0.06 g/l), and the deposits show fine-crystalline structure. Under otherwise equal conditions, the formation of spongy growth is intensified when a.c. is applied during electrodeposition of tin from stannate solution. Electrodeposition of lead from alkaline electrolyte with glycerin addition is not influenced by applying a.c. It was ascertained that cathodic and anodic polarization is reduced (by 4-5 mv) by the application of a.c., this reduction being intensified at a higher  $D_{\sim}/D_{-}$  ratio and a lower a.c. frequency. It was further ascertained that the application of a.c. with a frequency of 50 cycles at  $D_{\sim}/D_{-} = 2-10$  does not influence the current yield of metal. It amounts to 99-99.5% just as during electrolysis without application of a.c. K. M. Gorbunova is mentioned. There are 2 figures and 11 Soviet references.

Card 2/3

Effect of Alternating Current in Electro-  
deposition of Zinc, Lead, and Tin From  
Alkaline Electrolytes

S/153/60/003/005/010/016  
B013/B058

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskii institut im.  
D. I. Mendeleeva, Kafedra elektrokhimii (Moscow Institute  
of Chemical Technology imeni D. I. Mendeleev, Department  
of Electrochemistry)

SUBMITTED: May 6, 1959

Card 3/3

S/129/60/000/010/006/009  
E193/E483

AUTHORS: Kudryavtsev, N.T., Doctor of Chemical Sciences and  
Moroz, I.I., Candidate of Technical Sciences

TITLE: The Effect of Electrochemical Treatment on the  
Mechanical Properties of Steel

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov,  
1960, No.10, pp.36-40

TEXT: Zinc plating<sup>a</sup> in cyanide electrolytes brings about  
deterioration of the mechanical properties of steels У9 (U9)<sup>d</sup> and  
30ХГСА (30KhGSA)<sup>b</sup> due to hydrogen pick up. The object of the  
investigation, described in the present paper, was to establish how  
the properties of these steels are affected by zinc plating in  
cyanide-free electrolytes, copper and cadmium plating in cyanide  
solutions, lead and tin plating in acid electrolytes, and chromium  
plating. Five solutions were tried, the compositions of which  
were as follows (in g/litre):

1. ZnO - 15; NH<sub>4</sub>Cl - 250; H<sub>3</sub>BO<sub>3</sub> - 20; Carpenters Glue - 1; pH = 6,8-7.
2. ZnSO<sub>4</sub>·7H<sub>2</sub>O - 215; Al<sub>2</sub>(SO<sub>3</sub>)<sub>3</sub>·18H<sub>2</sub>O - 30; Na<sub>2</sub>SO<sub>4</sub>·10 H<sub>2</sub>O - 75; pH = 4-4,5.
3. Same as 2 with addition of 10 g/litre of dextrin.

Card 1/3

S/129/60/000/010/006/009  
E193/E483

The Effect of Electrochemical Treatment on the Mechanical Properties of Steel

4.  $Zn(BF_4)_2$  - 250;  $NH_4BF_4$  - 25; licorice root - 1.

5.  $ZnO$  - 20;  $NaOH$  - 120;  $Na_2SnO_3$  - 1.

The experimental work consisted in relating the duration of the plating operation (up to 60 min) to the properties of the specimens, determined immediately after plating. U.T.S., yield point, elongation, reduction in area, and the number of bending reversals that a specimen could stand without cracking were measured. The following conclusions were reached. (1) The harmful effect of zinc plating on the mechanical properties of steel can be reduced by using cyanide-free electrolytes. (2) The deterioration of the mechanical properties, caused by copper and cadmium plating in cyanide solutions, or tin and lead plating in acid electrolytes, is less than that due to zinc plating in cyanide solutions. (3) The ductility of steels studied is most adversely affected by chromium plating in sulphate electrolytes. (4) Best results are obtained by zinc plating in an electrolyte containing (in g/litre)

Card 2/3

S/129/60/000/010/006/009  
E193/E483

The Effect of Electrochemical Treatment on the Mechanical  
Properties of Steel

250 Zn(BF<sub>4</sub>)<sub>2</sub>, 25 NH<sub>4</sub>BF<sub>4</sub>, and 1 licorice root, or by cadmium  
plating in a solution containing (in g/litre) 40 CdO, 160 NaCN,  
25 NaOH, 40 (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and 10 dextrin. There are 5 figures,  
2 tables and 4 Soviet references.



Card 3/3

5.4600

1273, 1241, 1164

85200

S/129/60/000/011/010/016  
E073/E535

AUTHORS:

Smolenskaya, G. N., Engineer, Kudryavtsev, N. T., Doctor of Chemical Sciences Professor and Karatayev, V. M., Engineer

TITLE:

Electroplating of Titanium

PERIODICAL:

Metallovedeniye i termicheskaya obrabotka metallov, 1960, No.11, pp.42-43

TEXT:

In check tests in which the surface preparation and the plating conditions recommended by H. Richmond (Electroplating and Metal Finish, No.10, 1956) were applied, it was found that the plating peeled off easily when scratched with a knife, filed at an angle of 45° and on heating to 150-250°C. Therefore, the authors selected different plating conditions. The titanium was first degreased and etched in a mixture of 185 ml/l of 48% HF and 8.6 ml/l of 70% HNO<sub>3</sub> for several minutes. Following that, anodic treatment was applied for a few seconds with an anode current density of 0.1-10 A/dm<sup>2</sup> and more in solutions of various compositions and concentrations. Then, plating with nickel, copper, zinc and other metals was applied. In testing the bond strength (filing at an angle of 45°) satisfactory results were obtained only on powdered Ti,  
Card 1/3

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85200  
S/129/60/000/011/010/016  
E073/E535

### Electroplating of Titanium

which was preliminarily sand-blasted. Various other methods were also tried. On the basis of these experiments the following technology is recommended:

- 1) Degreasing with gasoline, rubbing with wet Vienna lime, followed by rinsing in cold running water.
  - 2) Pickling in a solution containing 185-200 g of HF (40%), 8-10 g of nitric acid and 1 litre of water at 18 to 25°C for 40-60 sec.
  - 3) Rinsing in cold running water.
  - 4) Rinsing for 2 to 3 min in ethylene glycol for the purpose of preventing dilution of the zinc electrolyte with water; this operation can be substituted by drying.
  - 5) Chemical or electro-chemical zinc plating in a solution containing 200 g of HF, 100 g of metallic zinc and 800 ml of ethylene glycol.
  - 6) Rinsing in cold water.
  - 7) Nickel plating in an ordinary sulphuric acid bath at 18 to 25°C with an initial current density of 1-2 A/dm<sup>2</sup>, which drops within 1 to 2 min to 0.5-1 A/dm<sup>2</sup>. The duration of the nickel plating is 1 to 1.5 hours.
  - 8) Rinsing in cold running water, following by drying with warm air
- Card 2/3

85200

S/129/60/000/011/010/016  
E073/E535

Electroplating of Titanium

at 250-300°C for 40 to 60 min in a furnace or in a drying chamber.  
This is followed by pickling in concentrated hydrochloric acid,  
plating with copper or other metals and polishing.  
After such treatment the components can be plated with other metals,  
e.g. chromium, rhodium, gold, silver etc.

X

Card 3/3

KUDRYAVTSEV, N.T.; TYUTINA, K.M.; CHVANKIN, I.V.

Determining the thickness of tin-nickel coatings. Zav.lab. 26  
no.3:301-302 '60. (MIRA 13:6)  
(Tin-nickel alloys)

82561

s/080/60/033/06/02/006

15. 9100  
18. 6100

AUTHORS: Kudryavtsev, N. T., Mikhaylov, N. I.

TITLE: Electrolytic Production of Highly-Dispersed Iron Powder<sup>21</sup>

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 6, pp. 1360-1365

TEXT: Large quantities of iron powder are needed by powder metallurgy. Sulfate, chloride, nitrate, citrate and oxalate solutions of iron salts and also alkaline solutions containing iron in the form of ferrites and suspensions of colloidal hydroxide particles were investigated to obtain a highly-dispersed homogeneous iron powder. The best results were obtained with an electrolyte described earlier (Ref. 7) containing iron sulfate and potassium sulfate up to saturation. The optimum acidity of the solution containing 82 g/l  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  ( $\sim 0.6$  n) is pH = 3.0-3.5. In this case the spongy deposit on the cathode is more homogeneous and purer than at higher pH values. The current yield of the metal decreases with an increase in the current density, especially at an increased pH value of 4.0-4.5. With a temperature increase from 20 to 40°C the current yield of the metal increases from 10 to 80%, but at a temperature above 30°C the spongy deposit is removed from the surface of the electrode only with difficulty. With an increase in the iron concentration the current yield of

Card 1/2

825 61

8/080/60/033/06/02/006

Electrolytic Production of Highly-Dispersed Iron Powder

the metal increases to a certain limit, beyond which it remains constant. The following conditions are recommended for electrolysis: electrolyte  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  55-75 g/l (0.4-0.55 n),  $\text{K}_2\text{SO}_4$  until saturation of the solution, pH = 3.0-3.5, temperature 18-22°C, current density 15-35 amp/dm<sup>2</sup> corresponding to the iron concentration. The spongy deposit is treated by a 3%-solution of sulfuric acid to eliminate hydroxides. Various inhibitors are added to prevent dissolution of iron metal. The introduction of 0.1% sodium arsenite showed the best results. The iron powder produced by this method contains 97% of iron metal compared to 75% in powder produced by other methods. Drying of the powder is carried out at room temperature during 2-3 days to avoid oxidation, heating and burning of the iron due to the oxygen of the air. Sedimentation analysis of the iron powder showed that 60% of the mass consists of particles with a radius of 3-5 $\mu$ . The addition of this powder to polyester-urethane materials twice increases their heat resistance. There are 4 graphs, 2 photographs, 1 diagram and 13 references: 10 Soviet, 2 English and 1 Indian.

SUBMITTED: November 2, 1959

Card 2/2

S/O80/60/033/011/003/014  
A003/A001

AUTHORS: Smirnova, A. M., Kudryavtsev, N. T.

TITLE: An Investigation of the Effect of Ultrasonic Oscillations<sup>21</sup> on the Process of Electric Deposition of Chromium ↗

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 11, pp. 2521-2526

TEXT: The effect of ultrasound in the process of chrome-plating on the current efficiency, the quality of chromium deposits and the value of cathode polarization was studied. Vibrators of the K-50-φ-2 (K-50-F-2) with oscillation frequencies of 17.5, 20.5, 27.5 and 80 kc/s were used. The intensity of the oscillations was controlled by varying the electric power from the generator within the range of 200 to 3,000 w. The cathodes were cylindrical samples of 16 mm in diameter and 30 mm long or flat samples with rounded edges of 50 x 20 x 2mm. The cathode material was CM10 (st.10) and CM20 (st.20) steel. The anodes were plates of lead with 6% antimony. The porosity of the samples was determined by the ferroxyl method on samples with a chromium layer of 20-40μ. On several samples the microhardness was tested with a ПМТ-3 (PMT-3) device with a load of 50 g. The solutions under investigation contained 100-450 g/l CrO<sub>3</sub> and 0.32 to 10 g/l

Card 1/3

S/080/60/033/011/003/014  
A003/A001

An Investigation of the Effect of Ultrasonic Oscillations on the Process of  
Electric Deposition of Chromium

$H_2SO_4$ . It was found that the dependence of the current efficiency on the current density and the temperature does not change under the effect of ultrasound. Variations in the frequency of the vibrator oscillations from 17.5 to 80 kc/s had no appreciable effect on the current efficiency. Deposits with satisfactory outer appearance were obtained in an electrolyte containing 250 g/l  $CrO_3$  at a  $CrO_3:H_2SO_4$  ratio of  $\leq 250$ . The deposition of chromium metal in an ultrasonic field takes place within a narrower range of  $H_2SO_4$  concentrations. The upper limit of  $H_2SO_4$  concentration at  $D_c = 10$  amp/dm<sup>2</sup> is 3.5 g/l, at 20 amp/dm<sup>2</sup> it is 5 g/l. Without ultrasound the respective values are 7 and 10 g/l. The quality of the deposits in an ultrasonic field is the same as without application of ultrasound. In some cases the porosity is lower. Ultrasound has practically no effect on the hardness of the deposits. The potentials were measured during electric deposition by a ППТБ-1 (PPTV-1) potentiometer. In the ultrasonic field, as well as during stirring of the electrolyte, a sharp drop in the cathode potential is observed at low current densities. Ultrasound inhibits the deposition of chromium due to difficulties in the formation of an adsorption film on the cathode. ✓

Card 2/3

S/080/60/033/011/003/014  
A003/A001

An Investigation of the Effect of Ultrasonic Oscillations on the Process of Electric Deposition of Chromium

Figure 2:

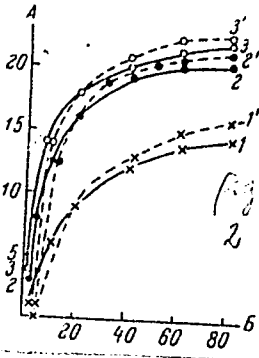


Figure 3:

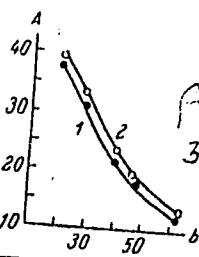


Figure 2. The Effect of the Current Density on the Current Yield Depending on the Composition of the Electrolyte at a Temperature of 45°C.

A - current yield (in %), B - current density (in amp/dm<sup>2</sup>). Composition of the electrolyte 1, 1' - 439 g/l CrO<sub>3</sub>, 4.07 g/l H<sub>2</sub>SO<sub>4</sub>; 2, 2' - 250.8 g/l CrO<sub>3</sub>, 2.5 g/l H<sub>2</sub>SO<sub>4</sub>; 3, 3' - 103 g/l CrO<sub>3</sub>, 1.08 g/l H<sub>2</sub>SO<sub>4</sub>. 1, 2 and 3 - without ultrasound; 1', 2' and 3' - with ultrasound.

Figure 3. Effect of the Temperature on the Current Yield in an Electrolyte Containing 250 g/l CrO<sub>3</sub>, 2.5 g/l H<sub>2</sub>SO<sub>4</sub>, at a Current Density of D<sub>c</sub> = 40 amp/dm<sup>2</sup>.

A - current yield (in %), B - temperature (in °C); 1 - without ultrasound, 2 - with ultrasound, f = 20 kc/s.

There are 8 figures, 1 table and 11 references: 8 Soviet, 2 English, 1 Swiss.  
SUBMITTED: March 11, 1960

Card 3/3



S/020/60/132/03/41/066  
B004/B007

5.1300  
AUTHORS: Kudryavtsev, N. T., Golovchanskaya, R. G., Baraboshkina, N. K.

TITLE: The Cathodic Process in the Electrolytic Depositing<sup>18</sup> of Titanium From Aqueous Solutions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3, pp. 636-638

TEXT: By way of introduction, the authors discuss the data given in publications on the cathodic depositing of titanium and, from the position of Ti between Al and Mn in the electrochemical series, they draw the conclusion that it must be possible to deposit it like Al from non-aqueous organic or aqueous solutions of its salt in the case of high hydrogen overvoltage. They investigated the electrolysis of alkaline solutions, for which purpose they used solutions of the metatitanates of Na, Mn, Cr, and Fe in NaOH. The low solubility of these metatitanates (6 - 8 g/l Ti) in NaOH may be increased by means of organic additions. The maximum titanium content of the solution (15 - 20 g/l) was obtained by leaching-out the sodium metatitanate with 20-30% NaOH at 50°C with the addition of organic

Card 1/3

The Cathodic Process in the Electrolytic  
Depositing of Titanium From Aqueous Solutions

S/020/60/332/03/41/066  
B004/B007

substances. Titanium is found as  $Ti^{4+}$  in the solution. As cathode, Cu, brass, Pt, and Pb, and as anode, stainless steel or Pt were used. The current yield was determined gasometrically (by measuring the deposited hydrogen) and gravimetrically (by measuring the deposited titanium). As shown in Fig. 1, the current yield decreases irrespective of the type of the cathode within 20-30 min from 60 to 0.5%. As soon as the cathode is completely covered with Ti, only hydrogen is deposited. The titanium layer on the cathode is 3-4 $\mu$  thick. When an anode made from stainless steel is used, the titanium deposit contains traces of Fe and Cr, and attains a thickness of 15 $\mu$ . As acid electrolytes, solutions of potassium fluoride were used, which were acidified with hydrofluoboric acid. There is no deposit of Ti on the cathode from compounds of  $Ti^{4+}$ . Only hydrogen is deposited, and  $Ti^{4+}$  is completely reduced to  $Ti^{3+}$ . Only after the ratio  $Ti^{4+} : Ti^{3+} = 1 : 1$  has been attained in the solution, does the cathodic depositing of titanium metal begin. No formation of  $Ti^{2+}$  in the solution was observed. Also in this case the current yield decreases (Fig. 2) as soon as the cathode is covered with Ti (3-4 $\mu$ ), but not to the same extent as in alkaline electrolytes, because the titanium deposited from acid electrolytes is more porous. The addition of surface-active substances

Card 2/3

The Cathodic Process in the Electrolytic  
Depositing of Titanium From Aqueous Solutions

S/020/60/132/03/41/066  
B004/B007

(gelatin, joiner's glue, glyccoll) does not influence the current yield.  
There are 2 figures and 15 references: 2 Soviet, 6 English, 3 German, and  
4 Japanese.

ASSOCIATION: Moskovskiy khimiko-tehnologicheskii institut im.  
D. I. Mendeleyeva (Moscow Institute of Chemical Technology  
imeni D. I. Mendeleyev)

PRESENTED: December 12, 1959, by A. N. Frumkin, Academician

SUBMITTED: December 12, 1959

Card 3/3

KUDRYAVTSEV, N. T., TUTINA, K. M., FIRGAR, S. M.

"Electrodeposition of Zinc-Nickel Alloys for Protecting Steel  
articles against Corrosion"

Report submitted at the Third Seminar on Electrochemistry, Karaikudi-3, S.RLY  
26-29 Dec 61

1. Department of Electrochemical Technology, Mendeleev's Institute of  
Chemical Technology, Moscow.

EYCHIS, Andrey Petrovich; KUDRYAVTSEV, N.T., doktor khim.nauk, prof.,  
retsenzent; RIKBERG, D.B., red.; GORNOSTAYPOL'SKAYA, M.S., tekhn.  
red.

[Crystallite; protective and decorative metal coating] Kristallit;  
zashchitno-dekorativnoe pokrytie metallov. Moskva, Gos. nauchno-  
tekhn. izd-vo mashinostroit. lit-ry, 1961. 142 p. (MIRA 14:6)  
(Protective coatings)

S/137/62/000/004/146/201  
A060/A101

AUTHORS: Kudryavtsev, N. T., Tyutina, K. M.

TITLE: Electrodeposition of a tin-nickel alloy

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 106, abstract 41649  
(V sb. "Elektrolit. osazhdeniye splavov", Moscow, Mashgiz, 1961,  
76 - 93)

TEXT: The article considers the conditions of deposition of an alloy of Sn-Ni from acid and alkaline electrolytes. The cathodic and the anodic processes occurring in the deposition of the alloy are analyzed in detail. The composition of the acid electrolytes and the operating schedule for depositing the Sn-Ni alloy with ~50 and ~65% Sn are recommended. A recommendation is given for the composition of an alkaline electrolyte and the operating schedule for depositing an alloy with a 5 - 12% Ni content. A method is given for determining the thickness of a Sn-Ni alloy deposit. There are 10 references. ✓

Ye. Layner

[Abstracter's note: Complete translation]

Card 1/1

S/123/62/000/006/012/018  
A004/A101

AUTHOR: Kudryavtsev, N. T.

TITLE: Electrodeposition of tin-bismuth and tin-antimony alloys

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 6, 1962, 43-44,  
abstract 6B215 (V sb. "Elektrolit. osazhdeniye splavov". Moscow,  
Mashgiz, 1961, 94-103)

TEXT: The author presents the results of investigating the conditions of electrodeposition of Sn-Bi and Sn-Sb alloys and the recommended electrolytes. For deposition of Sn-Bi alloys containing 5% Bi the following electrolyte is suggested (in g/l): tin sulfate  $\text{SnSO}_4$  - 45-54 (0.4 - 0.5 n); sulfuric acid  $\text{H}_2\text{SO}_4$  (specific gravity 1.84) - 100 (approximately 2 n); glue - 0.5; crude carboic acid - 5.0; bismuth nitrate  $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$  - 0.32 - 0.8 (0.002 - 0.005 n), at 20 - 25°C and a cathode current density of 0.5 - 2.0 amp/dm<sup>2</sup>. As anodes, pure tin should be used which is to be immersed in the electrolyte immediately prior to electrolysis. For depositing Sn-Sb alloys containing 5% Sb the electrolyte composition is the following (in g/l): tin sulfate - 45 - 54 (0.4 - 0.5 n); sulfuric acid  $\text{H}_2\text{SO}_4$  (specific gravity 1.84) - 100 (approximately

Card 1/2

S/123/62/000/006/012/018  
A004/A101

Electrodeposition of tin-bismuth ...

2n); glue - 0.5; crude carbolic acid - 5.0; ammonium fluoride or difluoro ammonium ( $\text{NH}_4\text{F}$  or  $\text{NH}_4\text{HF}_2$ ) 4 - 5 (approximately 0.1 n); antimony fluoride  $\text{SbF}_3$  - 0.3 (approximately 0.005 n), at 20 - 25°C and 0.5 - 3.0 amp/dm<sup>2</sup> current density. Anodes are similar. The author analyzes the deposition of Sn-Bi alloys without current. This was obtained by dipping tinned plates and the components in a solution containing 0.5 g/l  $\text{Bi}(\text{NO}_3)_3$  and 100 g/l sulfuric acid. After holding in this solution for 0.5 - 1.5 minutes, the plates were heated to 150°C. An analysis of the tin deposit of 10  $\mu$  thickness revealed a Bi-content of 4.5% after 0.5 min holding in the solution and 8.5% after 1 min holding. The author studied the effect of the heating time on the Bi-distribution in the deposit. He describes the method of electrolyte analysis for the  $\text{H}_2\text{SO}_4$ , Sn, Bi and Sb content and the Sn-Bi and Sn-Sb alloy deposits for the Bi and Sb-content.

[Abstracter's note: Complete translation]

Card 2/2



S/123/62/000/006/008/018  
A004/A101

AUTHOR: Kudryavtsev, N. T.

TITLE: Electrodeposition of lead-tin alloys

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 6, 1962, 43, abstract  
6B211 (V sb. "Elektrolit. osazhdeniye splavov". Moscow, Mashgiz,  
1961, 104-109)

TEXT: The author describes the results of investigations to determine the optimum conditions of electrodeposition of lead-tin alloys. He recommends the following electrolyte compositions for alloy coatings containing 8 - 12% tin (antifriction coatings) (in g/l): paraphenol sulfonic lead (or metallic lead) 97-138 (0.35 - 0.5 n), paraphenol sulfonic tin (or metallic tin) - 24 (0.1 n), paraphenolsulfonic acid 51 - 87 (0.35 - 0.5 n) gelatin - 2, at a temperature of 20 - 40°C and a cathode and anode current density of 1 - 2 amp/dm<sup>2</sup>. Anodes of a lead-tin alloy were used (approximately 10% Sn). The current efficiency at the cathode and anode amounted to 100%. With coatings of an alloy containing 20 - 60% tin, the electrolyte composition is as follows (in g/l): paraphenol sulfonic lead - 42-110 (0.15 - 0.4 n), paraphenolsulfonic tin (or metallic tin) - ✓

Card 1/2

Electrodeposition of lead-tin alloys

S/123/62/000/006/008/018  
A004/A101

60 - 119 (0.25 - 0.5 n), parafenolsulfonic acid (free) - 70-121 (0.4 - 0.7 n), gelatin - 1.5 - 3.0, at a temperature of 18 - 25°C and a cathode current density of 1 amp/dm<sup>2</sup>. The current efficiency amounts to 100%. In this electrolyte lead-tin alloy anodes are used with a relative lead and tin content corresponding to the composition of the cathode deposit. Corrosion tests of lead-tin coatings applied to copper plates showed that lead-tin coatings containing 8 - 12% tin possess the highest corrosion resistance. Metallographic investigations revealed that, after 2 hours heat treatment of lead-tin coatings at 150°C no structural changes could be detected in the deposits. It is therefore not expedient to subject binary lead-tin coatings to heat treatment immediately on the cathode.

[Abstracter's note: Complete translation]

Card 2/2

S/123/62/000/006/007/018  
A004/A101

AUTHOR: Kudryavtsev, N. T.

TITLE: Electrodeposition of zinc-nickel alloys

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 6, 1962, 42-43,  
abstract 6B210 ( V sb. "Elektrolit. osazhdeniye splavov". Moscow,  
Mashgiz. 1961, 110-124)

TEXT: The author presents the results of investigations to determine the optimum conditions for a joint deposition of zinc and nickel from cyanogen and ammoniate electrolytes. From cyanogen electrolytes, coatings were obtained, which contained 0.5 - 2% nickel, coatings from ammoniate electrolytes contained 10 - 30% nickel, the rest being zinc. Corrosion tests showed that, in an atmosphere with a constant high humidity, alloy coatings with 2% nickel are more resistant than pure zinc coatings. In a humid atmosphere with variable temperatures and in a 3% NaCl solution with periodic exposure to the atmosphere, such a coating is analogous to pure zinc. The maximum corrosion resistance is shown by an alloy containing 25 - 30% nickel, which during tests in a 3% NaCl solution spray at 30°C did not display any traces of zinc corrosion during 20 days. It is

Card 1/3

S/123/62/000/006/007/018  
A004/A101

Electrodeposition of zinc-nickel alloys

pointed out that the coating with this alloy does not ensure an electrochemical protection of steel parts from corrosion and is characterized by increased brittleness. The optimum coating results were obtained with an alloy containing 10 - 15% nickel. These coatings are elastic and show a greater corrosion resistance than pure zinc coatings, while they ensure an anodic nature of steel parts. During tests in a salt spray, the first signs of corrosion appeared on the alloy after 14 days, while pure zinc showed already corrosion signs after 2-3 days. The author recommends the following electrolyte composition for obtaining bright and lustrous coatings of a zinc-nickel alloy containing about 2% nickel (in g/l): zinc (in the form of complex salts) - 32 (1.04), sodium cyanide (total) - 75 - 100 (1.7 - 2.0 n), caustic soda (total) 68 (approximately 1.7 n), nickel (in the form of cyanogen salts) 0.15 - 0.75 (0.005 - 0.025 n) at a temperature of 20 - 25°C and a current density of 1 - 3 amp/dm<sup>2</sup>. The current efficiency amounts to 80 - 95% depending on the current density. Anodes of pure zinc are used. For the deposition of a (10 - 18% Ni) zinc-nickel alloy the following electrolyte is used (in g/l): zinc oxide - 15 (0.37 n), nickel chloride NiCl<sub>2</sub> · 6H<sub>2</sub>O - 12-36 (0.1 - 0.3 n), aluminum chloride - 250 (about 5 n), boric acid - 20, at a temperature of 40°C, a cathode density of 1 - 3 amp/dm<sup>2</sup>, a mean anode density of 0.1 - 0.5 amp/dm<sup>2</sup> and current efficiency of 95%. The electro-

Card 2/3

Electrodeposition of zinc-nickel alloys

S/123/62/000/006/007/018  
ACO4/A101

lyte is stirred mechanically or by compressed air. the anodes are of zinc or zinc and nickel with a surface ratio of 1 : 1 or 1 : 2. The author presents data on the cathode polarization during electrodeposition of zinc-nickel alloys, and describes methods of analyzing the electrolyte for its zinc and nickel content.

[Abstracter's note: Complete translation]

Card 3/3

30121  
S/137/62/000/003/013/191  
A006/A101

1.1600

AUTHORS: Kudryavtsev, N. T., Mikhaylov, N. I.

TITLE: Electrolytical preparation of high-dispersed iron powder

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 15, abstract 3V102  
("Tr. Mosk. khim.-tehnol. in-ta im. D. I. Mendeleeva", 1961, no. 32, 298-303)

TEXT: The authors studied conditions of electrolytical preparation of high-dispersed Fe-powder, homogeneous in respect to the size of particles. Best results were obtained with the use of sulfuric-acid electrolyte  $\text{FeSO}_4$  0.4 - C. n. +  $\text{K}_2\text{SO}_4$ , until the saturation of the solution at pH 3.0 - 3.5, 18 - 22°C temperature and 15 - 35 amp/cm<sup>2</sup> current density. For the purpose of obtaining acid-resistant powder, the spongy deposit in the form of pulp was processed for 10 minutes with 3%  $\text{H}_2\text{SO}_4$  solution with addition of 0.1% Na arsenite. The humid powder was, after washing in a filter with water and then with acetone or alcohol, placed in a 5 - 10 mm layer at the bottom of a high glass and was held in air at room temperature for 2 - 3 days. The black powder obtained contained 97% Fe-metal. There are 13 references. See also RZhMet, 1961, 1V153.

[Abstracter's note: Complete translation]

A. Pokhvisnev

Card 1/1

34380

S/539/61/000/032/005/017  
D202/D301

5.4700

AUTHORS: Kudryavtsev, N.T., Bek, R.Ya. and Tarasevich, M.R.

TITLE: The effect of periodical reversal of current direction on the concentration polarization

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32, 1961. Issledovaniya v oblasti elektrokhimii, 79-84

TEXT: The authors aimed at verification of the opinion of previous investigators that current reversal has a favorable effect on the speed of electrolysis and properties of the electro deposits. In the authors' opinion, current reversal, although it decreases polarization, causes periodically the dissolution of some part of the deposit; therefore, the total deposition rate is lowered. If the ratio of times of switch-on of cathodic and anodic current is  $K = \frac{\tau_c}{\tau_a}$ , then the rate of electrolysis

would not be determined by the working current density  $D_w$ , but a value  $D_{ef} = D_w \cdot \frac{k-1}{k+1}$ , (effective current density): The authors compared the

Card 1/4

S/539/61/000/032/005/017  
D202/D301

The effect of periodical ...

concentration polarization during electrolysis with direct current to that at electrolysis with reversing current, both processes having the same  $D_{ef}$ . They investigated these processes on silver nitrate solutions:  $AgNO_3$  (0.05M)  $NaNO_3$  (1 M) at  $pH = 1$  and on equimolecular  $K_3Fe(CN)_6$  and  $K_4Fe(CN)_6$  solutions on an apparatus permitting 2 to 3000 rev.p.m. with a constant  $k$  ratio; the dependence of potential and current intensity was registered by a tape oscillograph. The effect of current reversals in  $AgNO_3$  solutions has been studied at  $D_w = 0.5 \text{ a/dm}^2$ , with  $k = 6.39$  and  $16.4$  at  $30^\circ$  and  $50^\circ C$ .  $D_{ef}$  for  $k = 6.39$  was  $0.36 \text{ a/dm}^2$  and for  $k = 6.4$  -  $0.44 \text{ a/dm}^2$ . During electrolysis with direct current =  $0.5 \text{ a/dm}^2$  at  $30^\circ C$  a spongy deposit was formed, but with current density of  $0.36 \text{ a/dm}^2$  the deposit was compact. At  $50^\circ C$  it was compact in both cases. When reversible current was applied ( $k = 6.39$ , temp.  $30^\circ C$ ) a sponge was formed on the cathode when less than 10 rev.p.m. were used, but with higher reversal rates, a compact deposit was obtained; at  $50^\circ C$  such a deposit

Card 2/4



The effect of periodical ...

S/539/61/000/032/005/017  
D202/D301

was formed in both cases. The same phenomena were observed with  $k = 16.4$ . Similar results have been obtained with a mixture of ferrocyanide and ferricyanide ions. It is seen from the obtained oscillographs and corresponding graphs that with increasing reversal rate up to 60 per min., the concentration polarization is decreasing; further increase in alternation having but a very slight effect. At alternation rates up to 60 rev. per min. this polarization has a much larger value than when d.c. is applied, when its density is equal to  $D_{ef}$ ; at an alternation rate

higher than 60 rev./min. the value of concentration polarization approaches that obtained with d.c. In the author's opinion, this may be explained as follows: During the switch-on of anodic current, the ionic concentration on the cathode is increased by a partial dissolution of the metallic deposit and by ions diffusing from the bulk of solution; the polarization is lowered, the current density increases, and the loss of deposit is balanced by an increase in the speed of electrolysis. If the current reversal rate is low, after the concentration in the diffusion layer is restored, the ions would tend to diffuse into solution and the

Card 3/4

The effect of periodical ...

S/539/61/000/032/005/017  
D202/D301

polarization would increase. Therefore, the rate of electrolysis may be increased by reversing current only when it alternates very rapidly. The authors conclude that from the point of view of reagent supply to the cathode current reversal cannot be regarded as a means for intensification of electrolytic processes. There are 5 figures and 11 references: 7 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: G.W. Jernstedt, Steel, 120, no. 17, 100-102, 134, (1947); A. Hickling and H.P. Rothbaum, Trans Inst. Metal Finish, 34, 53 (1957).

Card 4/4

S/539/61/000/032/008/017  
D258/D301

AUTHOR: Kudryavtsev, N.T., and Bek, R.Yu.

TITLE: The influence of alternating current in the electro-  
deposition of zinc, lead, and tin from alkaline solutions

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no.  
32, 1961. Issledovaniya v.oblasti elektrokhimii; 255-258

TEXT: The authors aimed at improving the texture of electrodeposited Zn, Pb, and Sn by using alternating current superimposed onto direct current. This was done in view of the known formation of spongy deposits on the cathode occurring during the electrodeposition of Zn from NaOH solution, even when operating at current densities, lower than the limiting value. Specifically, Zn and Sn were deposited on polished steel cathodes, Pb -- on polished brass. The current densities (C.D.) used were: 0.2 - 0.5 Amp/dm<sup>2</sup> for Zn; 0.2-4 Amp/dm<sup>2</sup> for Pb; and 0.2-5 Amp/dm<sup>2</sup> for Sn. The electrolytes had the following compositions: (1) Zn - 0.25N (ZnSO<sub>4</sub>·7H<sub>2</sub>O); NaOH (total) - 2.5 N. (2) Zn 0.25N (ZnSO<sub>4</sub>·7H<sub>2</sub>O) NaOH<sub>tot.</sub> 2.5N; Sn-0.5g/l  
Card 1/3

S/539/61/000/032/008/017

The influence of alternating ...

D258/D301

(3) Pb-0.8N; NaOH<sub>(total)</sub>-4N; Glycerol - 50 cm<sup>3</sup>/l. (4) Na<sub>2</sub>SnO<sub>3</sub> - 80 g/l;  
NaOH<sub>(free)</sub>-10 g/l. Smooth and semi-lustrous Zn deposits were obtained  
on operating with an a.c. frequency of 20 to 70 c/s and at ratio, C.D.  
a.c./C.D.d.c. of 2-3. Deposits obtained in that way from solution (1)  
showed clearly outlined crystal boundaries; at higher frequencies, the  
crystalline regularity decreases. Spongy deposits appear at a frequency  
of 300-500 c/s and the beneficial effect of a.c. vanishes completely  
at 800-1000 c/s. The addition of Sn (solution no. 2) or Pb had an adverse  
effect on the quality of deposited Zn. The application of a.c., at 20-  
300 c/s and C.D. a.c./C.D.d.c.  $\approx$  1 on the deposition of Pb from solution  
no. 3 had no effect at all, while deposition of Sn from solution no. 4  
was adversely affected, under the same conditions. The adverse effect on  
Sn vanished at frequencies, higher than 300 c/s. The effect of a.c. on  
cathodic and anodic polarization was investigated in solution no. 2. At  
50°C and without stirring, both anodic and cathodic polarizations were  
decreased by 2-5 mV, on using a C.D. a.c./C.D.d.c. ratio of 5. The higher

Card 2/3

The influence of alternating ...

S/539/61/000/032/008/017  
D258/D301

ratio had no effect at all. The current efficiency was almost independent of the type of current used. There are 4 figures and 12 references: 10 Soviet-bloc and 2 none-Soviet-bloc.



Card 3/3

S/539/61/000/032/009/017  
D247/D301

AUTHORS: Kruglikov, S.S., Kudryavtsev, N.T. and Sobolev, R.P.  
TITLE: Investigating electrolytes for smooth nickel plating  
PERIODICAL: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32,  
1961. Issledovaniya v oblasti elektrokhemii, 259-265

TEXT: The authors mention the development of additives for smooth electroplating which has taken place in the USA and concludes that the composition of the nickel electrolyte given, used with the addition of 0.5 g/l of coumarin at a pH of 4-6 and a current density of 4-6 amp/dm<sup>2</sup> at 50 ± 2°C with mechanical stirring provides good conditions for a semi lustrous smooth nickel plate. The influence of the various electrolyte conditions has also been studied using a quantitative measurement of the smoothing capacity. There are 7 figures and 4 non-Soviet-bloc references. The 4 most recent references to the English-language publications read as follows: W.R. Meyer, Proc. Am. Electropl. Soc., 24, 123 (1936); D.G. Foulke and O. Kardos, Proc. Am. Electropl. Soc., 43, 172, 181, (1956);

Card 1/2

Investigating electrolytes ...

S/539/61/000/032/009/017  
D247/D301

J.D. Thomas, Proc. Am. Electropl. Soc., 43, 60, (1956); S.A. Watson and  
J. Edwards, Tr. Inst. Met. Finish., 34, 167, 222, (1957).

Card 2/2

S/539/61/000/032/010/017  
D247/D301

AUTHORS: Bakhchisarayts'yan, N.G., Kudryavtsev, N.T. and Kokarev,  
G.A.

TITLE: Investigating electrolytic nickel plating with intermit-  
tent current and with alternating current

PERIODICAL: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32,  
1961. Issledovaniya v oblasti elektrokhemii, 266-271

TEXT: The authors studied the effects of such currents on the appearance of the plate, the current efficiency and the polarization of the nickel electrode. An electrolyte of composition  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  215g/l,  $\text{H}_3\text{BO}_3$  30g/l, NaF 4.2-4.5 g/l and NaCl 4 g/l was used in all the experiments. The deposit was 10 microns thick and was made on iron and brass plates 2.5x2.0 cm in size. The anode surface made of electrolytic nickel was from 2.5-5.0 times greater than the cathode surface. A platinum electrode of 0.35 cm<sup>2</sup> surface area was used in all the experiments. The appearance

Card 1/4



Investigating electrolytic ...

S/539/61/000/032/010/017  
D247/D301

of the deposit was assessed visually. An oscilloscope was used for measuring polarization and current strength, and the current efficiency was found by using two copper coulometers. Short period cycles were used. For intermittent current the cycles were 0.33, 1.0 and 1.9 sec. At 20°C and a current density of 3 amp/dm<sup>2</sup>, there was no observable difference in the appearance of the plate from that obtained with constant current, but the comparative current efficiency fell by 10%. The authors explained this by the diffusion of hydrogen ions into the cathodic layer of the electrolyte, during the breaks in current, producing a greater acidity round the cathode than that found under conditions of constant current. With breaks of shorter duration, the current efficiency increased but the effect was small. The rate of plating did not change with the use of intermittent current. The cathode potential reached its maximum almost immediately following connection, and on switching off, decreased sharply at first and then more slowly. It remained at greater negativity during the breaks than under stationary conditions. With alternating current, at 20°C, with a cathodic current density of 2-3.5 amp/dm<sup>2</sup>, and an anodic current density of 2-3 amp/dm<sup>2</sup>, a bright coating

Card 2/4

Investigating electrolytic ...

S/539/61/000/032/010/017  
D247/D301

was obtained up to 5-7 microns thick. With increased thickness the brightness decreased. At 40°C and current density of 4-6 amp/dm<sup>2</sup>, variation of the ratio of the durations of cathodic and anodic connection from 2 to 9 and a corresponding variation of the cycle time from 0.24 to 1.0sec gave no change in the appearance of the plate. The use of alternating current produced a noticeable decrease in current efficiency at the cathode. This could have been due to the ionization of hydrogen adsorbed on the cathode, taking place during anodic connection and increasing the hydrogen ion concentration round the cathode. This explanation was supported by the increase of current efficiency with the increased duration of cathodic connection, while the period of anodic connection was kept constant. Low pH values decreased the current efficiency to approximately the same extent for constant and intermittent current, while with alternating current pH values below 2.5 produced a sharper reduction. With a constant cathodic current density of 2 amp/dm<sup>2</sup>, an increase in anodic current density of 3 amp/dm<sup>2</sup> made the current efficiency fall to 30%, and a further increase to 4 amp/dm<sup>2</sup> gave a reduction to 4-5% and a sharp deterioration in the quality of the plate.

Card 3/4

Investigating electrolytic ...

S/539/61/000/032/010/017  
D247/D301

Oscillograms for the alternating current show some cathodic depolarization in comparison with constant conditions, but if the potentials are referred to the effective current density there is no depolarization. There are 7 figures and 6 references: 6 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: G.W. Jernstedt. Patent USA 2,470,775, 24.V.1949.

Card 4/4

34382

S/539/61/000/032/011/017  
D204/D301

1.1800

AUTHORS: Kudryavtsev, N.T., Golovchanskaya, R.G. and Baraboshkina,  
N.K.

TITLE: The cathode process in the electrolysis of Ti from aqueous solutions

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32, 1961. Issledovaniya v oblasti elektrokhemii, 272-277

TEXT: Electrodeposition of Ti was studied on Cu, brass, Pt and Pb cathodes, with Pt and stainless steel anodes, from alkaline and acid aqueous solutions, since little work has been done in this field. The standard potential, position in the electronegative series and hydrogen overvoltage of Ti are first discussed, on the basis of results obtained by Soviet and Western workers. The metatitanates of Na, Mn, Cr and Fe were tried but proved only sparingly soluble in aq. NaOH and hydrolyzed readily. In the case of Na metatitanate the maximum concentrations (15-20 g Ti/l) were obtained by dissolving the titanate in 20-30% aq. NaOH, with additives, ✓

Card 1/3

The cathode process in the ...

S/539/61/000/032/011/017  
D204/D301

at 20°C. Electrolysis was conducted in a 250 ml glass bath, finding that Ti deposited from tetravalent ions only. The current efficiency ( $\eta$ ) fell sharply over 20-30 min., from 45-60% to ~0.5%, independently of the material of the cathode, (except during the first few minutes), owing probably to the high cathode potential of Ti and the relatively low hydrogen overvoltage on Ti.  $\eta$  Also decreased with increasing current density,  $D_k$ , (20-40 amp/dm<sup>2</sup>) and increasing temperature (20 to 50°C). The acid electrolytes were based on 40% HF and metallic Ti and the experiments were conducted in a 250 ml plexiglass bath, dividing the cathode and anode regions with a polyvinyl diaphragm. It was found that Ti was deposited only from Ti<sup>3+</sup> ions and only when Ti<sup>3+</sup>:Ti<sup>4+</sup> was 1:1 or higher. Current efficiency fell as before, from 10-20% to ~1-6%, after 30 min. The temperatures studied were 20 and 50°C,  $D_k$  40 - 20 amp/dm<sup>2</sup> and the pH 2.2 - 2.4. Brilliant silvery coatings of Ti, 3-4  $\mu$  thick were obtained from both the alkaline and acid electrolytes, but deposits from the fluoride solutions tended to be more porous. Methods of analysis of the solutions and of the deposit are given in full. There are 3 figures.

Card 2/3

S/539/61/000/032/011/017  
D204/D301

The cathode process in the ...

4 tables and 16 references: 3 Soviet-bloc and 13 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: Sin-ichi Satoh and Koshin Jamane, J. of the Scientific Research Institute, v. 50, March(1956); Tadzima, Fudzivara and Mori, [ Abstracter's note: Names transliterated ], J. Electrochem.Soc. Japan, 24, 212-216, (1956); M.E. Straumanis, S.T. Shin and A.W. Schlechten, J. Phys. Chem., 59, 317, (1955); Tadzima, Seki and Mori, J. Electrochem. Soc. Japan, (1956).

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Card 3/3

9438J

S/539/61/000/032/012/017

D204/D301

1.1800

AUTHORS: Kudryavtsev, N.T., Mel'nikova, M.M. and Palanker, V. Sh.

TITLE: The cathode process in the electrodeposition of a Fe-Cr alloy from a borofluoride electrolyte

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32, 1961. Issledovaniya v oblasti elektrokhemii, 278-282

TEXT: Electrodeposition was studied from an electrolyte containing  $\text{Fe}(\text{BF}_4)_2$ ,  $\text{Cr}(\text{BF}_4)_3$  and  $\text{HBF}_4$  with known contents of  $\text{Cr}^{2+}$  and  $\text{Cr}^{3+}$ . A constant concentration of Cr, equal to 3-5% of the total, was set up by passing a current of density 10 amp/dm<sup>2</sup> for 1 hour before each experiment. The cell used allowed estimation of the current consumed for the discharge of  $\text{H}_2$  and for the alloy. The influence of  $\text{Cr}(\text{BF}_4)_3$  and  $\text{Fe}(\text{BF}_4)_2$  concentrations on the composition and current efficiency of the deposit was investigated, as well as that of  $\text{HBF}_4$  content, temperature and cathode current density  $D_k$ . It was found that the deposits were dark and

Card 1/2

The cathode process in the ...

S/539/61/000/032/012/017  
D204/D301

impure when  $\text{HBF}_4$  was low and that Cr was not deposited from solutions containing  $< 0.3$  moles  $\text{Cr}(\text{BF}_4)_3/\ell$  and when  $D_k < 5$  amp/dm<sup>2</sup>. Optimum results were obtained with an electrolyte containing 1.2 - 1.5 moles Cr  $(\text{BF}_4)_3$ , 0.15 - 0.3 moles  $\text{Fe}(\text{BF}_4)_2$  and 2 moles  $\text{HBF}_4$  per liter, at 40°C, with  $D_k$  equal to 30 amp/dm<sup>2</sup>. The current efficiency was 20% and the alloy ( $\sim 35\%$  Cr) was bright for thicknesses up to 10  $\mu$ , but brittle. The Cr content of the alloy increased when  $D_k$  was increased and the temperature was lowered, but the current efficiency of Fe was practically independent of temperature and  $D_k$ . The results are discussed and explained in terms of polarization curves plotted for the several processes taking place. There are 7 figures, 1 table and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: Fysey and Sasaci, Trans. Amer. Electrochem. Soc., 59, no. 23, 445, (1931); Snavely, Faust and Brinde, US. Pat. 2,693,444 (1954); McGrow, Gurclis, Faust and Brinde, J. Electrochem. Soc., 4, (1954).

Card 2/2



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S/539/61/000/032/013/017  
D204/D301

11800

AUTHORS: Kudryavtsev, N.T., Tyutina, K.M., Chvankin, I.V. and Tsupak, T.Ye.

TITLE: Electrodeposition of a Sn-Ni alloy from alkaline cyanide solutions

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32, 1961. Issledovaniya v oblasti elektrokhemii, 283-288

TEXT: A study of the joint deposition of Ni and Sn from stannate solutions containing additions of complex Ni cyanide. The influence of Ni concentration in the solution and of current density,  $D_k$ , on the quality, composition and current efficiency of the alloy were studied at 65°, 75° and 85°C, depositing the metals on brass or Ti plates. Cathode potentials at various  $D_k$ 's were measured during the deposition of the alloy and of Sn alone. Alloys with 10-26% Ni could be obtained from solutions containing 0.12 - 0.6 g Ni/l, 53 g  $Na_2SnO_3$ /l and 10 g NaOH/l. (alloys of

Card 1/3

Electrodeposition of a Sn-Ni ...

S/539/61/000/032/013/017  
D204/D301

20-26% Ni were bright), but the current efficiency fell sharply on increasing the Ni and lowering the Sn content in the electrolyte and at lower temperatures. Thus on increasing Ni from 0.06 to 0.6 g/l at 75°C, at  $D_k = 1 \text{ amp/dm}^2$ , the current efficiency decreased from 65 to 8%.

A proportion of Ni in the deposit rose with increasing Ni content of the solution, but was practically unaffected by changes in temperature or  $D_k$ . Cathode polarization in the deposition of the alloy was more pronounced than during the deposition of Sn alone. The results are discussed in terms of the polarization curves derived for the various processes taking place, concluding that the joint deposition of Ni and Sn facilitates the evolution of  $H_2$  by reducing its overvoltage on the cathode. Passivated Sn anodes or anodes of Sn and an insoluble metal were found suitable and the following conditions are recommended for the deposition of an alloy containing 5-12% Ni: electrolyte composition - Sn (as  $Na_2SnO_3$ ) 30g/l, Ni (as  $Ni(CN)_2$ ) 0.06 - 0.12 g/l, NaOH 10 g/l, NaCN 0.25 g/l; temperature 75°C;  $D_k$  equal to 1 amp/dm<sup>2</sup>. Analyses of the electrolyte and of the

Card 2/3

Electrodeposition of a Sn-Ni...

S/539/61/000/032/013/017  
D204/D301

deposits are described in some detail. There are 6 figures, 1 table and 3 references: 2 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: J.W. Cuthbertson, N. Parkinson and H.P. Rooksby, J. Electrochem. Soc., 100, 3, (1953).

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Card 3/3

S/539/61/000/032/014/017  
D204/D301

AUTHORS: Kudryavtsev, N.T., Tyutina, K.M. and Baraboshkina, N.K.

TITLE: The effects of organic additives on the cathode process in the electrolysis of Sn-Ni alloys

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no.32, 1961. Issledovaniya v oblasti elektrokhemii, 289-292

TEXT: Continuation of earlier work, inspired by Soviet and Western investigations which showed the addition of surface active organic compounds could influence the composition and quality of alloys deposited from electrolytes containing more than 1 metallic salt. Additions of p-phenyl sulphonic acid (I) prepared from (a) freshly distilled phenol, (b) chemically pure synthetic phenol, (c) technical phenol and (d) crude carbo-  
lic acid, were made to the electrolyte consisting of 300 g/l  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ ,  
50 g/l  $\text{SnCl}_2 \cdot 6\text{H}_2\text{O}$  and 60 g/l  $\text{NH}_4\text{F}$ , to investigate their effects on the quality and composition of the deposit and on the cathodic polarization.

Card 1/2

The effects of organic ...

S/539/61/000/032/014/017  
D204/D301

The additions were made at 50-65°C, at pH 4.5. It was found that the cathodic polarization, quality and composition of the deposits depended on the purity of the phenol from which I was prepared. Additions of I prepared from freshly distilled or chemically pure phenol had practically no effect. 0.5-0.7 moles/l of I prepared from technical phenol displaced the electrodeposition potentials in the electronegative direction by 100-200 mv and lowered the Sn content in the alloy by 11-14% (to 51-54%), with current densities of 0.5-4.0 amp/dm<sup>2</sup>. The deposits were shiny and elastic. Raising the temperature to 55-65°C further decreased the Sn to 49-50%. The effect of I prepared by the sulphonation of crude carbolic acid increased the cathodic polarization by 400 mv during the deposition of Sn and, thereby, lowered the latter to 20% in the alloy; the deposits were gray when the current density exceeded 0.2 amp/dm<sup>2</sup>. The addition of 1-1.5 g/l of di-2-dimethylamino-5-pyridyl methane increased the cathodic polarization for both Sn and Ni and had, therefore, little effect on the alloy composition. The deposits were elastic, light in color and contained up to 60% Sn. There are 2 figures and 5 references: 4 Soviet-bloc and 1 non-Soviet-bloc. ✓

Card 2/2

34385

S/539/61/000/032/015/017  
D204/D3011P.1230  
1.1800

AUTHOR: Kudryavtsev, N.T. and Altapova, N.M.

TITLE: Electrodeposition of a tungsten-cobalt alloy

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 32, 1961. Issledovaniya v oblasti elektrokhemii, 293-297

TEXT: This investigation is based on earlier Soviet and Western studies which showed that W could be electrodeposited in the presence of small amounts of the Fe group metals. In the present work the authors studied the electrodeposition of a W - Co alloy from  $(\text{NH}_4)_2\text{SO}_4$  solutions containing  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$  and  $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$ , with and without additions of citric acid, boric acid and  $\alpha$ -nitroso- $\beta$ -naphthol, at  $75^\circ\text{C}$ . The effects of W and Co concentrations, pH, temperature and current densities (D) on the quality and composition of the deposit, current efficiency ( $\eta$ ) and cathodic polarization were investigated. The cathodes were of polished  $\text{Mn}-90$  (L-90) brass plates 0.5 mm thick, and Pt wire spirals served as anodes. The deposits were analyzed colorimetrically for Co, using a universal

Card 1/3

Electrodeposition of a ...

S/539/61/000/032/015/017  
D204/D301

Y/A -2 (UM-2) monochromator. Initial experiments showed that already at  $\sim 2$  g  $\text{CoCl}_2 \cdot \text{H}_2\text{O}/\text{l}$  in the electrolyte, the Co content of the alloy reached 50%, within a wide range of D (1-35  $\text{amps}/\text{dm}^2$ ). The deposits were shiny. Increasing the tungstate content lowered  $\eta$  and raised only slightly the W content of the alloy. Lowering the pH below 10.5 lead to the precipitation of  $\text{CoWO}_4 \cdot 2\text{H}_2\text{O}$ . Additions of 50 g citric acid/l increased the range of D in which the deposits were shiny by a factor of 2, allowed the pH to be lowered to 8-7, decreased  $\eta$ , made the deposit more brittle and had no appreciable effect on the alloy composition. The last 2 observations were also true of boric acid (20 g/l) and  $\alpha$ -nitroso- $\beta$ -naphthol (10 ml/l). Increasing D led to an increase of W in the alloy but lowered  $\eta$ ; lowering the temperature considerably lessened  $\eta$  but had no effect on the composition of the alloy. Cathodic polarization was noticeable at relatively low D - this is explained by the complexing of both W and Co alloys to form  $[\text{Co}_3\text{WO}_4 \cdot (\text{NH}_3)_n]^{4+}$ . X-ray analysis showed the deposit containing  $\sim 50\%$  W to be a solid solution with a hexagonal lattice

Card 2/3

Electrodeposition of a ...

S/539/61/000/032/015/017  
D204/D301

(a : c ~ 1 : 6); this alloy resisted  $H_2SO_4$  and  $HNO_3$  but not  $HCl$ . The thin (1 - 4  $\mu$ ) coatings were porous, but quickly became compact in greater thickness and at higher D's. The recommended conditions for the deposition of a 45-55% W alloy are: electrolyte - 40 g/l of  $Na_2WO_4 \cdot 2H_2O$ , 2 g/l of  $CoCl_2 \cdot 6H_2O$ , 132 g/l of  $(NH_4)_2 SO_4$  and ~ 45 g/l of  $NH_4OH$  to give pH ~ 11; temperature  $75^\circ C$ ; D equal to 1 - 20 amp/dm<sup>2</sup>. Current efficiency varies between 30 and 70%, depending on D. There are 4 figures and 16 references: 11 Soviet-bloc and 5 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: W.E. Clark and M.L. Holt, Trans. Electrochem. Soc., 94, 244, (1948); M.H. Lietzke and M.L. Holt, *ibid.*, 94, 252, (1948); L.E. Vaaler and M.L. Holt, *ibid.*, 90, 12, (1946); A. Brenner, P. Burkhead and E. Seegmiller, J. Research, Nat. Bur. Standards, 39, 351, (1947).

Card 3/3



34386

S/539/61/000/032/016/017  
D204/D301

1.1600

AUTHORS: Kudryavtsev, N.T. and Mikhaylov, N.I.

TITLE: Electrolytic preparation of highly dispersed iron powder

SOURCE: Moscow. Khimiko- tekhnologicheskii institut. Trudy, no.32,  
1961. Issledovaniya v oblasti elektrokhemii, 298-303

TEXT: The above was studied in view of the lack of a satisfactory method of the widely applicable, pure Fe powder of uniform particle size distribution. Sulphate, chloride, nitrate and oxalate solutions were tried, as well as alkaline electrolytes containing Fe as ferrites or in colloidal suspension as the hydroxide, using Ni-coated brass cathodes and low C steel anodes. It was found that a sulphate solution containing the saturation amount of  $K_2SO_4$  was the most suitable and the effects of Fe concentration, temperature, current density (D) and pH on the current efficiency and particle size of the powder were further studied in this electrolyte. Optimum results were obtained in solutions containing  $53.82g FeSO_4 \cdot 7H_2O/l$ , at  $18-22^\circ C$ , with  $D=15-35 amp/dm^2$ , in the pH

Card 1/2

Electrolytic preparation ...

S/539/61/000/032/016/017  
D204/D301

range of 3.0-3.5. On the basis of the above work, the authors constructed an apparatus yielding ~10g of dry Fe powder/hr, consisting of a 60° glass funnel of ~3l capacity, with a central, polished Ni or stainless steel cathode and low C steel anodes arranged concentrically 70-80 mm away. The crude Fe sponge, containing hydrated FeO, was drawn off every 30-40 min and the electrolyte was cooled by circulation. The pH was adjusted by additions of conc. H<sub>2</sub>SO<sub>4</sub>; the current was 10-30 amps, at 6-10v. Fe powder was obtained by a 10<sup>2</sup> min extraction of FeO with 3% H<sub>2</sub>SO<sub>4</sub> con-

taining 0.1% Na arsenite and was washed with water and acetone or alcohol. It was then dried at room temperature for 2-3 days, in 5-10 mm layers. The product thus obtained contained 97% of metallic Fe, with mean particle diameter of 4-40 μ. Sedimentation analysis showed ~60% to lie in the range of 6-10 μ. Addition of this powder to polyester urethanes increased the heat stability of the latter by a factor of 2. There are 5 figures and 13 references: 10 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: S. Ranganathan and B.R. Nijhavan, J. Scient. and Industr., no. 7, 333-4, (1955); W.M. Shafer and C.R. Harr, J. Electrochem. Soc., 105, no. 7, 413-417, (1958). X

Card 2/2

BEK, R.Yu.; KUDRYAVTSEV, N.T.

Effect of alternating current on the electrodeposition of zinc.  
Zhur.prikl.khim. 34 no.9:2013-2020 S '61. (MIRA 14:9)  
(Zinc plating) (Electric currents, Alternating)

BEK, R.Yu.; KUDRYAVTSEV, N.T.

Effect of the periodical change of the direction and pulsation  
of a current on the electrodeposition of zinc from zincate so-  
lutions. Zhur.prikl.khim. 34 no.9:2020-2027 S '61. (MIRA 14:9)  
(Zinc plating) (Electric currents)

KUDRYAVTSEV, N.T.; BEK, R.Yu.; TARASEVICH, M.R. (Moskva)

Effect of periodic reversal of current on concentration  
polarization. Zhur. fiz. khim. 35 no.7:1507-1511 J1 '61.  
(MIRA 14:7)

1. Khimko-tehnologicheskij institut im. D.I.Mendelejeva.  
(Electroplating) (Polarization (Electricity))

KRUGLIKOV, S.S.; KUDRYAVTSEV, N.T.; VOROB'YEVA, G.F.; L'VOVSKIY, V.M.

Effect of ripple current on surface leveling in nickel plating.  
Dokl. AN SSSR 140 no.4:877-879 O '61. (MIRA 14:9)

1. Moskovskiy khimiko-tekhnologicheskii institut im. D.I.Mendeleyeva.  
Predstavleno akademikom A.N.Frumkinym.  
(Nickel plating)

KUDRYAVTSEV, N. T. (Moscow)

"Elektroniederschlage von Silber aus Cyanelektrolyten bei erhohter Stromdichte."

report presented at the VII Intl. Colloq., Ilmenau Inst. of Technology, Ilmenau, GDR,  
22-26 Oct 1962.

KUDRYAVTSEV, N.T.; PSHILUSSKI, Ya.B.; POTAPOV, I.I.

Investigating chromium sulfate solutions for the electrolytic  
deposition of chromium. Izv.vys.~~shk.~~khim.i khim.tekh.  
5 no.4:617-620 '62. (MIRA 15:12)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni  
Mendeleyeva, kafedra tekhnologii elektrokhimicheskikh  
proizvodstv.

(Chromium sulfate) (Chromium--Plating)



S/080/62/035/002/011/022  
D202/D302

AUTHORS: Kudryavtsev, N. T. and Smirnova, A. M.

TITLE: The effect of ultra-sound on the process of zinc electrodeposition

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 2, 1962, 328-334

TEXT: The authors studied the effect of ultra-sound on the rate of zinc deposition, quality of deposits and the polarization during plating in cyanide, acid and zincate electrolytes. A plating bath, fitted with nickel vibrators of 17.5 and 20 kc/s/sec was used; the ultrasonic field intensity being varied by power input on the vibrator from 100 to 1400 V-amp. The authors give full details of the electrolyte compositions, the experimental conditions and results. It was found that in cyanide plating the use of ultra-sound increased the current yield and allowed an increase in the admissible c.d. by 3 - 5 times, the resulting zinc plate being brighter and more compact than without its use; maximum plating velocity being obtained at low NaCN concentration; even a slight increase

Card 1/3

The effect of ultra-sound ...

S/080/62/035/002/011/022  
D202/D302

in the normality of NaCN leading to a marked drop in the current yield. The ultra-sound has practically no effect on microhardness of the deposit. In acid electrolytes the use of ultra-sound gave brighter deposits at c.d. much higher than without its use. In the absence of ultra-sound, at c.d. higher than 4 - 5 A/dm<sup>2</sup> the zinc plate was spotted and uneven, with current yields of ~85%. With the aid of ultra-sound a compact and bright zinc plate was obtained at c.d. 50 - 55 A/dm<sup>2</sup>, with 95 - 99% yields. Similar results have been obtained in zincate electrolytes: With ultra-sound the zinc plate was compact and bright. The results depend, however, on the power input to the vibrator: It has to be higher than 400 V-amp at c.d. 30 A/dm<sup>2</sup>. The cathode and anode polarization decreased in all electrolytes under the effect of the ultrasonic field, especially in zincate solutions and less markedly in the cyanide and acid ones. At the end of the article the authors propose chemical compositions of electrolytes and plating conditions for all three plating processes with the use of ultra-sound. There are 7 figures, 4 tables and 16 references: 12 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: S.R.

Card 2/3

The effect of ultra-sound ...

S/080/62/035/002/011/022  
D202/D302

Rich, Technical Proceedings at the 42nd Annual Convention, 131,  
1955; D. J. Fishlock, Met. Ind. 93, 109, 1958.

SUBMITTED: January 10, 1961

Card 3/3

KUDRYAVTSEV, N.T.; BEK, R.Yu.; GUREVICH, M.A.

Electrodeposition of silver by alternating current. Zhur.prikl.-  
khim. 35 no.3:553-562 Mr '62. (MIRA 15:4)  
(Silver plating)

S/080/62/035/004/008/022  
D202/D301

5.1319

AUTHORS: Kudryatsev, N. T., Kruglikov, S. A., Vorob'yeva, G. F.  
and Zubov, M. S.

TITLE: A study of the smoothing effect of some nitrogen-con-  
taining heterocyclic compounds

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 4, 1962, 777-781

TEXT: The authors tested quinoline, methyl-quinolinium iodide, quinaldine and acriflavin as smoothing agents in nickel electroplating and worked out optimal conditions for their use. In their opinion only quinaldine may be of practical use, because quinoline and its methiodide have comparatively small smoothing effects and give brittle deposits. Acriflavin produces a favorable effect but only in a very narrow concentration range, which makes it unsuitable for practical purposes. An addition of saccharin to electrolytes containing quinoline or its derivative gives a less brittle plate, but markedly lessens the smoothing effect of these compounds. Experimental details and the obtained results are given. There are

Card 1/2

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S/080/62/035/004/008/022  
D202/D301 .

A study of the ...

5 figures, 1 table and 13 references: 3 Soviet-bloc and 10 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: S. A. Watson and J. E. Edwards, Trans. Inst. Metal Finish, 34, 167, 222, 1957; E. Raub, Plating, 46, 486, 1958; S. E. Beacom and B. J. Riley, Metal Ind., 95, 103, 1959; S. E. Beacom and B. J. Riley, J. Electrochem. Soc., 106, 309, 1959.

SUBMITTED: March 27, 1961

Card 2/2

S/080/62/035/004/009/022  
D202/D301

5.1310

AUTHORS:

Kruglikov, S. S., Kudryatsev, N. T., Vorob'yeva, G. F.  
and L'vovskiy, V. M.

TITLE:

Investigating electrolytes for smooth nickel plating

PERIODICAL:

Zhurnal prikladnoy khimii, v. 35, no. 4, 1962, 781-786

TEXT: The aim of this study was to check the hypothesis of Western investigators: Watson, Edwards, Foulke and Kardos, concerning the mechanism of the action of smoothing agents in nickel electroplating. The present authors used a pulsating d.c. and coumarine and quinaldine as smoothing agents, these compounds being added to the electrolyte separately or in mixture. The results proved that in the smoothing process the relative speed of diffusion of the agent to various parts of the cathode is the decisive factor. The addition of coumarine is most effective between 20 - 30°C; when an excess of this compound is used the electrolyte becomes self-regulating, as the coumarine solution remains saturated during the whole plating process. The addition of a mixture of the above compounds

Card 1/2

Investigating electrolytes for ...

3/080/62/035/004/009/022  
D202/D301

is recommended, an even nickel plate being obtained in a wider range of conditions, and much more compact than with single agents. Experimental details and results are given. There are 5 figures, 2 tables and 7 references: 4 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: S. A. Watson and I. Edwards, Trans. Metal Finish, 34, 222, 1957; D. G. Foulke and O. Kardos, Proc. Am. Electroplater's Soc., 43, 172, 1965; O. Kardos, Proc. Am. Electroplater's Soc., 43, 181, 1956.

SUBMITTED: March 27, 1961

Card 2/2

X



KUDRYAVTSEV, N. I.; BIK, R. M.

Effect of the anion  $M$  on the cathodic process of silver  
electrodeposition from cyanide electrolytes when superposing  
the alternating over the direct current. Zhur. prikl. khim.,  
35 no. 5:1030-1035 My (1962) (R. 15:5)  
(Silver plating) (Cyanides) (Infrared)

37818

S/080/62/035/005/006/015  
D204/D307

18.83/0

AUTHORS: Kudryavtsev, N. T., Tyutina, K. M. and Firger, S. M.

TITLE: Protecting steel articles against corrosion with an electrolytic zinc-nickel coating

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 5, 1962, 1035-1043

TEXT: Cathodic codeposition of Ni and Zn was studied from cyanide (I) and ammoniacal (II) solutions, obtaining alloys containing 0.5 - 2% Ni from the first electrolyte and 10 - 30 (or more)% Ni from the second. The following conditions are recommended for the production of high quality coatings (~2% Ni) from I: Electrolyte - Zn (as a complex) 32 g/l, NaCN 75 - 100 g/l, NaOH 70 g/l, Ni (as cyanide) 0.025 - 0.75 g/l; temperature - 20 - 25°C; current density (D) - 1 - 3 amp/dm<sup>2</sup>. The corresponding current efficiencies were 80 - 96% and the anodes were pure Zn. The Ni content of the deposit increased with increasing Ni concentration in the electrolyte and fell with increasing D. Electrolyte II was investigated in

Card 1/2

Protecting steel articles ...

S/080/62/035/005/006/015  
D204/D307

greater detail since deposits containing 10 - 20% Ni were found to be the best protection against corrosion. It was found that the Ni content in the alloy increased with temperature and pH and depended on the Ni concentration in II and on D as in the case of I. Best quality deposits containing 10 - 18% Ni were obtained at 40°C and at pH 6.5 - 6.8 from a solution containing 15 g ZnO, 12 - 36 g  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ , 250 g  $\text{NH}_4\text{Cl}$  and 20 g  $\text{H}_3\text{BO}_3$  per liter, at a cathode current density of 1 - 3 amp/dm<sup>2</sup>. The cathode current efficiency was 95% under these conditions and the anodes were Zn or Zn/Ni. Solution II was sufficiently stable w.r.t. composition and showed good buffer properties at pH 6 - 10. Pitting of the deposits could be partially alleviated by the addition of various organic compounds to the electrolyte, but was best avoided by stirring the solution during electrolysis. There are 2 figures and 2 tables.

SUBMITTED: April 13, 1961

Card 2/2

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S/076/62/036/010/003/005  
B101/B186

AUTHORS: Bek, R. Yu., Gamburg, Yu. D., and Kudryavtsev, N. T.

TITLE: Electrodeposition of bright copper with superposition of a-c on d-c

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 10, 1962, 2244-2245

TEXT: The effect of a nickel sublayer on the brightness of electrodeposited copper was studied. A bright nickel sublayer was obtained from an electrolyte containing 170 g/l  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ , 30 g/l  $\text{H}_3\text{BO}_3$ , 12 g/l KCl, and 6 g/l naphthaline disulfonic acid with a pH of 4 - 6, at a current density given by V. V. Ostroumov and I. F. Plokhotnikova (Zh. prikl. khimii, 1520, 1668, 1958). However, copper deposited on it from an electrolyte containing 200 g/l  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  and 100 g/l  $\text{H}_2\text{SO}_4$  stayed matt even when quinaldine or coumarone had been added to the nickel electrolyte. Polishing of the sublayer was also ineffective. Increase in the current density to 13 - 17  $\text{ma/cm}^2$  at 18°C and to 21  $\text{ma/cm}^2$  at 25°C caused the

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Card 1/3

Electrodeposition of bright copper with ...

S/076/62/036/010/003/005  
B101/B186

formation on the nickel of a matt, bluish thin coating of Ni oriented along the (011) axis. At an optimum ratio  $D_{a-c}/D_{d-c} = 1.10 - 1.15$ , very bright copper deposits with a high reflecting power were obtained on such sublayers with a thickness not less than  $7 - 8 \mu$ . Increase of the ratio to more than 1.2, reduced the brightness and a change in the d-c density from 3 to  $10 \text{ a/dm}^2$  had no effect as long as  $D_{a-c}/D_{d-c}$  remained unchanged.

An X-ray analysis shows that the bright copper plating obtained by a-c superposition is oriented along the (125) axis and its texture could be characterized in individual cases as quasi-microcrystalline, whereas copper deposited on a non-oriented Ni sublayer has a texture oriented along the (011) axis. This confirms the assumption of Ostroumov and Plohotnikova that the sublayer structure has an orienting effect on the crystallization of the first copper layer. The authors, however, assume that the orienting effect depends not on cathode passivation, but on other factors, such as a reduced oversaturation with a-c during electrolysis, which means a shift in conditions for the formation of seed crystals toward equilibrium. There are 2 figures.

Card 2/3

Electrodeposition of bright copper with...<sup>S/076/62/036/010/003/005</sup>  
B101/B186

ASSOCIATION: MKhTI im. D. I. Mendeleeva, Kafedra elektrokhimicheskikh  
proizvodstv (MKhTI imeni D. I. Mendelejev, Department of  
Electrochemical Productions)

SUBMITTED: February 16, 1962

Card 3/3

BEK, R.Yu.; KUDRYAVTSEV, N.T.; NECHAYEV, Ye.A.

Cathodic polarization in the electrodeposition of silver from  
ferrocyanide electrolytes. Zhur. fiz. khim. 36 no.11:2506-  
2508 N'62. (MIRA 17:5)

1. Moskovskiy khimiko-tehnologicheskii institut imeni  
D.I. Mendeleeva.

KRUGLIKOV, S.S.; NUDRYAVTSEV, N.T.; VOROBYEVA, G.F.; ANTONOV, A. I.

"On the Mechanism of the Action of Levelling Agents in the Electrodeposition of Metals."

Report presented at the 11th meeting CITCE, Intl. Comm. of Electrochemical Thermodynamics and Kinetics, Moscow, 19-25 Aug 63.

Mendeleev Chemico-Technological Institute, Moscow, U.S.S.R.



L 10107-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD  
ACCESSION NR: AP3001951 S/0226/63/000/003/0018/0024

AUTHOR: Kudryavtsev, N. T.; Mikhaylov, N. I.; Novikov, A. A.

TITLE: Production of very fine copper powder

57  
56

SOURCE: Poroshkovaya metallurgiya, no. 3, 1963, 18-24

TOPIC TAGS: very fine copper powder, cupric sulfate reduction, reduction with titanous sulfate, batch-type process, continuous process, solution acidity, current density, lead anodes, titanic sulfate reduction

ABSTRACT: Very fine, pure copper powder with particles of spheroidal shape were produced by the reaction between titanous sulfate (Ti sub 2 (SO sub 4) sub 3) and cupric sulfate (CuSO sub 4) in an aqueous solution containing 200-250 g/dm sup 3 of sulfuric acid. With cupric sulfate added in excess of the stoichiometric amount, yields of 99.5--99.9% of the theoretical were obtained. Particle size varied depending on the concentration of titanous sulfate; at a concentration of, about 1.0 g-equiv/dm sup 3, particles were 1- to 10-micron in diameter. At concentrations of less than 0.1 g-equiv/dm sup 3, particles were nearly colloidal

Card 1/32

L 10107-63

ACCESSION NR: AP3001951

and formed a stable suspension with water. The higher the acidity of the titanous sulfate solution, the purer the copper powder obtained; in a 6--10% solution 200--250 g/dm sup 3 of sulfuric acid produced the optimum acidity. Titanic sulfate produced by the reaction was reduced to titanous sulfate by electrolysis with direct current; the best results were obtained with a cathode current density of 1--3 amp/dm sup 2 and lead anodes. The reduction of cupric sulfate to copper powder and the reduction of titanous sulfate to titanous can be done in the same vessel by either a batch-type method -- dripping a saturated solution of cupric sulfate into a solution of titanous sulfate -- or a continuous method -- anodic dissolution of metallic copper in a solution of titanous sulfate. In both, the reduction of titanous sulfate on lead or copper cathodes occurs simultaneously with copper reduction of cupric sulfate. The batch-type method yields particularly high-purity powders. The advantages of the continuous method are that 1) copper waste products can be used as anodes, 2) there is no loss of titanium and copper salts, and 3) the process may be automated. Laboratory units for both processes have been built, and procedures for treating, drying, and controlling the quality of the powders produced are described. Orig. art. has: 1 table and 3 figures.

ASSOCIATION: Moskovskiy khimiko-tehnologicheskii institut im. D. I. Mendeleeva  
(Moscow Institute of Chemical Technology)

Card

2/32

ACCESSION NR: AR4018306

S/0137/64/000/001/0033/0034

SOURCE: RZh. Metallurgiya, Abs. 10235

AUTHOR: Kudryavtsev, N. T.; Mikhaylov, N. I.; Novikov, A. A.

TITLE: Preparation of highly dispersed powders of iron and copper

CITED SOURCE: Tr. Kuybyshhevsk. aviats. in-t, vy\*p. 16, 1963, 6-9

TOPIC TAGS: iron powder, copper powder, electrolytic reduction cell

TRANSLATION: A description is given of laboratory methods of preparing pure, finely dispersed Fe and Cu powders. Fe is obtained in a conical glass electrolytic reduction cell with anodes of low-carbon steel strip and a cathode of Ni or Ti. The electrolyte consists of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  (55-75 g/l) and  $\text{K}_2\text{SO}_4$  with pH=3.0-3.5. Current density is 15-35 a/dm<sup>2</sup> and temperature is 18-22°. The Fe sponge formed at the cathode is loosened by the evolving H<sub>2</sub> and collects as a pulp in the bottom part of the cell. Acidity of the electrolyte is maintained by adding H<sub>2</sub>SO<sub>4</sub>. The recovered pulp is treated with 3-5% H<sub>2</sub>SO<sub>4</sub> containing 1 g/l of Na arsenite inhibitor to remove the hydroxide. The Fe powder is then washed with water and acetone, and dried in air at room temperature. The purity of Fe powder is 97%, and its specific surface,

Card 1/2

ACCESSION NR: AR4018308

30 m<sup>2</sup>/g. The Cu powder is obtained by the homogeneous reduction of CuSO<sub>4</sub> in acid medium by Ti sulfate in an electrolytic reduction cell containing a 5% solution of Ti<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> (200-250 g/l) acidified with H<sub>2</sub>SO<sub>4</sub>. The cell has Cu anodes, a soluble Cu cathode (source of Cu ions in solution), and an insoluble Pb cathode for regenerating Ti which is enclosed in a ceramic diaphragm with a 10% solution of H<sub>2</sub>SO<sub>4</sub>. The current density is 6 a/dm<sup>2</sup>. The Cu powder forming in the bulk of the electrolyte deposits on the bottom of the bath is filtered, washed with water and dried.

V. Meshpor

SUB CODE: MM

ENCL: 00

Card 2/2

L 52560-65 EPP(c)/EWT(m)/EWP(z)/EWP(i)/EWP(b)/EWA(d)/EWP(t) Pad IJP(c) JD/  
HW/WE

ACCESSION NR: AT5012665

UR/2539/63/000/044/0091/0095

26

AUTHOR: Kudryavtsev, N. T., Firger, S. M., Dokina, N. N.

25

B+1

TITLE: Electrodeposition of a cadmium-nickel alloy

SOURCE: Moscow. Khimiko-tekhnologicheskii institut. Trudy, no. 44, 1963. Issledovaniya v oblasti fizicheskoy khimii, analiticheskoy khimii i elektrokhimii (Research in the field of physical chemistry, analytical chemistry and electrochemistry), 91-95

TOPIC TAGS: electroplating, alloy electrodeposition, cadmium alloy deposition, nickel alloy deposition, cadmium corrosion resistance, electrolyte composition

ABSTRACT. The purpose of this study was to increase the corrosion resistance of cadmium by alloying it with nickel and thus to protect parts operating under severe corrosive conditions: high temperatures and moisture content, in an atmosphere consisting of the products of combustion of organic fuel. Cd<sup>2+</sup> and Ni<sup>2+</sup> ions are discharged at the cathode from pyrophosphate solutions, forming alloys in which the Cd/Ni ratio depends on the conditions of electrolysis. A study was made of the influence of concentration of the main components, temperature, pH of the solution, current density, and stirring on the quality and composition of the deposit, current efficiency, and stability of solution. Under all conditions, the deposition rate of cadmium was higher than that of nickel. To

Card 1/2

L 52560-65

ACCESSION NR: AT5012665

deposit a Cd-Ni alloy containing 10 to 15% Ni, an electrolyte containing ethylenediamine is recommended having the following composition:  $K_4P_2O_7$  - 200 g/L, CdO - 6 g/L (0.1 N),  $NH_4SO_4 \cdot 7H_2O$  - 14 g/L (0.1 N), ethylenediamine - 15 ml (20% solution), gum - 2 g/L, pH 9.5. The conditions of electrolysis are: temperature 40-45°C; current density up to 0.5 A/dm<sup>2</sup> without stirring and up to 2 A/dm<sup>2</sup> with stirring; cadmium anodes; anodic current density 0.2-0.5 A/dm<sup>2</sup>. The electrolyte is stirred with compressed air or by mechanical means. Orig. art. has: 1 figure and 1 table.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskij institut (Moscow Chemical Engineering Institute)

SUBMITTED: 00

ENCL: 00

SUB CODE: IC, MM

NO REF SOV: 005

OTHER: 004

Card 2/2 *MB*

L 32243-65 EWT(m)/EWP(t)/EWP(b) LFP(c) JD/JG

ACCESSION NR: AR5004770

S/0137/64/000/010/G033/G034

SOURCE: Ref. zh. Metallurgiya, Abs. 10G232

AUTHOR: Kudryavtsov, N. T.; Smirnova, T. G.

TITLE: Electrolytic deposition of iron-chromium alloys

CITED SOURCE: Tr. Mosk. khim.-tekhrol. in-ta im. D. I. Mendeleeva, vyp. 44, 1963, 102-107

TOPIC TAGS: iron base alloy, chromium containing alloy, electrolyte, metal electrolytic deposition

TRANSLATION: On the basis of tests carried out, the following conditions are recommended for the electrodeposition of iron-chromium alloys containing 27-35% chromium: composition of the electrolyte -  $\text{Cr}_2(\text{SO}_4)_3 \cdot 6\text{H}_2\text{O}$  160 g/l (2 N.),  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  30-50 g/l (0.2-0.3 N.),  $\text{NH}_2\text{CH}_2\text{COOH}$  150 g/l (2 N.). Temperature 20°,  $D=7-12 \text{ a/dm}^2$ , pH 2.3 - 2.4. Yield of alloy based on current 20-26%. Microhardness of the alloy containing 32% chromium is 600  $\text{kg/mm}^2$ . The deposits of alloy are even, light, and shining. 11 literature titles. G. Svodtseva.

Card 1/1 SUB CODE: MM ENCL: 00

KUDRYAVTSEV, N.T.; MIKHAYLOV, N.I.; NOVIKOV, A.A.

Obtaining a highly-dispersed copper powder. Porosh.met. 3 no,3:  
18-24 My-Je '63. (MIRA 17:3)

1. Moskovskiy ordena Lenina khimiko-tekhnologicheskij institut  
imeni D.I.Mendeleeva.



L 10686-63

EWP(q)/EWT(m)/BDS--ASD/ESD-3--RM/JD

ACCESSION NR: AP3002400

8/0153/63/006/002/0274/0279

AUTHOR: Kudryavtsev, N. T.; Pshilusski, Ya. B.TITLE: Investigation of the electrodeposition of chromium from chromium sulfate solutions

SOURCE: IVUZ. Khimiya i khimicheskaya tekhnologiya, v. 6, no. 2, 1963, 274-279

TOPIC TAGS: electrodeposition of chromium, chromium sulfate solutions, complex Cr-amino acid compounds, buffering, Beta-chrome

ABSTRACT: Cr sup 3+ forms a whole series of complex compounds with amino acids (glycine, asparagine), assuring high buffering in these solutions. The best electrodeposition of Cr is from 1-2N chromium solutions with a high glycine concentration at pH 2.5-3 at room or elevated temperature. In the presence of glycine the cathodic potential is displaced toward negative values because of complex formation; increasing temperature to 40C displaces potential in the positive direction and increases yield of precipitated metal with the current. These electrolytic chromium deposits do not have cracks, adhere well to the base-metal surface. They are of hexagonal Beta chrome structure. "V. A. Kononovich took part in the experimental work." Orig. art. has: 7 figures.

Association: Moscow Inst. of Chemical Technology

Card 1/21

KUDRYAVTSEV, N.T.; SMIRNOVA, T.G.

Electrodeposition of iron from sulfate electrolytes in the presence of aminoacetic acid (glycine). Izv.vys.ucheb.zav.; khim. i khim. tekh. 6 no.6:997-1001 '63. (MIRA 17:4)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni Mendeleeva, kafedra tekhnologii elektrokhimicheskikh proizvodstv.

KUDRYAVTSEV, N.T., prof.; KRUGLIKOV, S.S., kand. khim. nauk;  
VOROB'YEVA, G.F., kand. khimich. nauk

Electrolytic metal plating with the leveling of the surface  
of articles. Zhur. VKHO 8 no.5:493-501 '63. (MIRA 17:1)

L 12676-63

ACCESSION NR: AP3000644

8/0080/63/036/003/0543/0550

EWP(q)/EWT(m)/BDS AFFTC/ASD JD/MH

57

AUTHOR: Glazunova, V. K.; Kudryavtsov, N. T.

55

TITLE: Investigation of the conditions of spontaneous growth of crystal fibers in electrolytic coatings 18

SOURCE: Zhurnal prikladnoy khimii, v. 36, no. 3, 1963, 543-550

TOPIC TAGS: crystal growth, electrolytic tin coatings, tin, copper, lead, recrystallization

ABSTRACT: Experiments showed that the growth of crystal fibers in electrolytic tin coatings occurred spontaneously, independently of oxidation in dry or damp atmosphere, and was probably caused by internal stresses in the deposits. The difference in incubation period and crystal growth rate in coatings is explained by the magnitude of internal deformation in the Sn lattices. Significant acceleration of crystal growth of Sn deposited on brass is apparently connected with diffusion of Zn from the brass into the Sn coating. Coatings on Zn and Cu also showed short crystal incubation periods and rapid growth; Ni, Sn, and steel substrates reduced the effect, and on Ag and Fe there was no crystal formation in 4 years. The decrease in the crystal growth rate, proportional to the increase in the deposit thickness, is apparently caused by the decrease in internal stresses. Addition of

Card 1/2

L 12676-63

ACCESSION NR: AP3000644

thiourea to the electrolyte in depositing Cu produced striking crystal growth in Sn coatings. Coatings deposited at 0° were very fine grained and stressed; crystal growth therein was rapid. Sn-Cu and Sn-Ni deposits showed no structural change. In Sn-Pb, the incubation period was retarded, while in Sn-Zn the characteristic crystal growth appeared in 6 months. Reversing the current or increasing the current density up to 1.2 sq dm had no effect; at 2-3 sq dm, the incubation period increased and the growth rate was decreased. Heating had a decelerating effect, proportional to time and temperature of heat, on crystal growth. This also points to the role of internal stresses in the growth mechanism of the crystals. This phenomenon represents a peculiar form of recrystallization in Sn Coatings. Orig. art. has: 4 tables, 1 figure, 3 photographs. 2

ASSOCIATION: none

SUBMITTED: 31Oct61

DATE ACQ: 12Jun63

ENCL: 00

SUB CODE: CH

NO REF SOV: 009

OTHER: 005

Card 2/2

KUDRYAVTSEV, M. I.

AND NO. 938-15 12 June

## ELECTRODEPOSITION OF Tl FROM AQUEOUS SOLUTIONS (USSR)

Kudryavtsev, M. I., and R. G. Golovchanskaya. IN: Akademiya nauk SSSR. Doklady, v. 148, no. 6, 21 Feb 1963, 1339-1342. S/020/63/148/006/019/023

Electrodeposition of Tl from aqueous solutions of its salts presents serious difficulties owing to a high negative potential of the reduction of Tl ions, the low overpotential of H on Tl, and the tendency of Tl to absorb H and to passivate readily in air. Tl cannot be deposited on Tl cathodes but only on cathodes of other metals, such as Pb, Cu, Pt, Ni, or Fe. However, as soon as the cathode surface becomes coated with a continuous layer of Tl 3 to 4  $\mu$  thick, the deposition stops. X-ray diffraction analysis of the Tl deposited on a Cu cathode revealed that Tl diffuses into the Cu, forming an alloy which has a disordered rhombic lattice corresponding to the  $TlCu_3$ - $TlCu_4$  compounds. The diffusion causes a depolarization of Tl ions and makes possible a further deposition, which continues until the Tl content in the upper surface layer reaches 100%. The electrodeposited Tl has the same hexagonal lattice as the metallurgical Tl. [DV]

Card 1/1

KRUGLIKOV, S.S.; VOROB'YEVA, G.F.; KUDRYAVTSEV, N.T.; YARLYKOV, M.M.;  
ANTONOV, A.Ya.

Mechanism of surface leveling in the electrodeposition of metals.  
Dokl. AN SSSR 149 no.4:911-914 Ap '63. (MIRA 16:3)

1. Moskovskiy khimiko-tekhnologicheskii institut im. D.I.Mendeleyeva.  
Predstavleno akademikom A.N.Frumkinym.  
(Electroplating)

KRUGLIKOV, S. S.; KUDRYAVTSEV, N. T.; ANTONOV, A. Ya.; DRIBINSKIY, A. V.

"A study of levelling in nickel and copper."

Report to be submitted to the International Council For the Electrodeposition and Metal Finishing, 6th International Metal Finishing Conference, London, England, 25-29 May 64.



KUDRYAVSTEV, N.T., doktor khimicheskikh nauk; SMIRNOVA, T.G., kand. tekhn. nauk.

Electrolytic deposition of iron chromium alloys. Mashinostroyeniye  
no. 5260-61 S-0 '64 (MIRA 1822)

J. 13252-65 EWT(m)/ERP(t)/ERP(b) Pad ASD(m)-3/AFIC(p) JD/HW/JG  
ACCESSION NR: APL047695 S/0304/64/600/005/0071/0072

AUTHORS: Tsupak, T. Ye. (Engineer); Kudryavtsev, N. T. (Doctor of chemical sciences); Oveyanikova, L. V. (Engineer) B

TITLE: Nickel-chromium alloy coating d

SOURCE: Mashinostroyeniye, no. 5, 1964, 71-72

TOPIC TAGS: electroplating, nickel alloy, chromium alloy, metal coating

ABSTRACT: The conditions for electroplating of Ni-Cr alloys from solutions containing trivalent Cr in complicated combinations with glycol were experimentally investigated. Three, 4, and 6 gram-moles of glycol were used for 1 gram-atom of Cr in sulphate, chloride, and mixed solutions at 20-40C. The percentage of Cr in the deposit and the yield was measured as a function of Ni concentration in the solution, and the properties of the coating were observed as a function of plating thickness. The effects of additives such as ammonia ions were also investigated. It was found that the best electrolyte for plating with Ni-Cr alloys (10-16% Cr) should contain 160 g/ltr chromium sulphate (2n.), 240 g/ltr nickel chloride (2 n.) and 200 g/ltr glycol. The solution should be at 40C and have a pH of 2.0-2.7. Operation with the above electrolyte over an extended period of time (50 amp - hr/ltr) using a pure Ni anode and 20-30 amp/dm<sup>2</sup> gave a constant yield of 30-32% if  
Card 1/2

L 13253-65  
ACCESSION NR: AP4047695

the pH was periodically corrected. Orig. art. has: 2 figures. 0

ASSOCIATION: none

SUBMITTED: 00

SUB CODE: MM

NO REF SOV: 000

ENCL: 00

OTHER: 000

Card 2/2

L 38293-65 EWP(m)/EWP(b)/EWP(t) LWP(c) JD

ADMISSION NR: AP5011514

UR/0286/64/000/023/0069/0070

AUTHOR: Kudryavtsev, N. T.; Tyutina, K. M.; Fatakh-Alla, M. I.E.; Tyurina, N. A.

Electrolytic cadmium plating. Class 43, No. 106248

18  
B

Bulleten' izobreteniy i tovarnykh znakov, no. 31, 1964, 63-70

TOPIC TAGS: cadmium, electroplating

Abstract: A method of electrolytic cadmium plating from a cadmium oxide electrolyte is proposed for producing quality coatings where deposition is done in an electrolyte containing:

Ingredient	g/l
cadmium oxide	64 (1.0N)
aminoacetic acid	150 (2.0N)
sodium chloride	80 (1.5N)
gelatin	5-10
thiocarbamide	2.5

at a temperature of 18-25 C, pH=7.5 and  $D_c = 0.1-2.0 \text{ a/dm}^2$ .

Card 12