PC-300
Cyanide Copper Process

Application

Pc-300 Cyanide Copper is applied as a first layer for copper-nickel-chrome coatings as well as a single coating for special applications.

Make-up concentrations:

Cyanide copper Salt	140 g/l

desired values:

copper	18 g/l (15-20 g/l)
free Sodium cyanide	10 g/l (10-15 g/l)

temperature:	70 °C (50-80 °C)
pH value: iron/steel:	12 (11.0-12.8)
zinc die cast:	11 (10.5-11.5)
aluminium, magnesium:	10 (9.5-10.5) (adjust the pH with tartaric acid or KOH)
cathodic current density:	0.3-1 A/dm2 (barrel) 0.5-4 A/dm2 (rack)
bath voltage:	1-3 V
current efficiency:	75 % (65-90 %)
deposition rate:	0.35 µm/min (at 1 A/dm2)
ratio anode/cathode:	2:1
anodes:	electrolytical copper as bars (99.95-99.99 %)
anode bags	out of resistant material (e.g. Nylon), or using diaphragm
agitation: rack agitation	(ca. 4-12 m/min)
barrel rotation	ca. 2-6 rpm
tank material:	steel with rubber or plastic coating; lead is attacked
filtration:	to avoid rough deposits, continuous filtration is necessary (min.1-5 circles/h)
heating:	thermostatically controlled heating of resistant material (e.g. Teflon)
exhaustor:	required for worker's protection

Note:

Too low anode surface leads to a brown-black oxide layer on top of the anodes and results in higher bath voltage.

Analysis

Sample Preparation

Take the sample at a homogeneously mixed position and let it cool down to room temperature. If dull, allow to settle and decant or filter.

Copper

Reagents: Ammonium persulfate, conc. ammonia solution, hydrogen peroxide H_2O_2 (30 %), 0.1 N EDTA solution,
Indicator: PAN (1-(2-Pyridylazo)-2-naphthol, 1 g/l in ethanol)
Process: Pipette 2 ml bath solution into a 250 ml Erlenmeyer flask, add 25 ml demineralised water and strirr for 5 minutes. Boil for 15 min until the solution becomes dark brown and dull. Add 2-3 g ammonium persulfate (solution becomes clear blue) and 5 ml ammonia (solution becomes deep blue). Dilute with further 50 ml demineralised water, add 4-6 drops of PAN indicator (no more; otherwise end point is not visible) and titrate with 0.1 N EDTA solution from blue to green-grey.
Calculation: consumption in ml · 3.18 = g/l Cu
Correction: rise by 1 g/l Cu = add 7.5 g/l Cyanide copper Salt PC-300.

Trouble Shooting

Problem	Possible cause	Adequate action
matt Cu-layer	a) too low in free cyanide	analyse and adjust
	b) too high current density	decrease current density
	c) too low bath temperature	heat up to 70- 80 °C
	d) too low pH or too low concentration of hydroxide	adjust the pH to 11.5 with KOH
	e) brightener is consumed	add brightener
	f) wetting agent is consumed	add wetting agent
	g) too high carbonate content	analyse, freeze out or precipitate with barium sulfate
rough and red-brown Cu-layer	a) too high carbonate content	analyse, freeze out or precipitate
	b) too low in free cyanide	analyse and adjust
	c) bath impurities (e.g. anode sludge)	filtrate the electrolyte and use anode bags
no or little copper layer	a) too low in free cyanide	add cyanide
	b) too low metal concentration	add CuCN
	c) too high carbonate content	analyse, freeze out or precipitate
bath colour changes to blue-green	a) too low in free cyanide	analyse and adjust
strong hydrogen evolution during copper plating	a) too high current density (cathode and anode)	clean the anodes and increase the cathode surface; decrease

the cathodic current density
b) copper content is too low
(low conductivity)
analyse and adjust CuCN
c) too high in free cyanide add CuCN
copper layer with
stripes and spots
a) too low pH or too low
concentration of hydroxide
adjust the pH to 11.5 with KOH
b) too low in free cyanide analyse and adjust
c) electrolyte is not wetting well add wetting agent
d) pretreatment check the pretreatment
relief-like Cu deposition distance to the anode too short increase distance
matt and hard a) too high current density decrease current density
copper layer b) too low in free cyanide add cyanide
hard, brittle copper
layer
a) too high current density
(cathode and anode)
clean the anodes and increase
the cathode surface; decrease
the cathodic current density
porous copper layer a) too high carbonate content analyse, freeze out or precipitate
with barium
b) electrolyte is not wetting well add wetting agent
c) pH is too high for plating Zn,
base material is attacked
lower the pH using tartric acid or
KHSO3
white spots after storing
time
a) porous base material long pickling, long anodic
degreasing and good pre-dip
firstly, plating a flash-copper
layer with low current density
pre-dip in 4-10 g/l tartaric acid
b) included hydrogen pickling with inhibitor (SurTec
424); long anodic degreasing
c) pretreatment in general
(especially for zinc die cast)
optimate the pretreatment
blister a) too low pH or too low
concentration of hydroxide
adjust the pH to 11.5 with KOH
b) too high in free cyanide analyse and adjust
c) too low bath temperature heat up to 70-80 °C
d) pretreatment: base material
was passive
improve the pretreatment
adhesion problems pretreatment: base material was
passive
improve the pretreatment

Possible Problems at the Anodes

anode problems possible cause necessary action

white anode film, cell
voltage rises during the
deposition
a) anodes are passive remove the anode film, evtl.
increase the anode surface

b) insufficient pretreatment
(degreasing)
improve degreasing and pickling
c) too low bath temperature heat up the electrolyte
grey-green to black
anode film
a) too low in free cyanide analyse and adjust
b) anodic current density
is too high
remove the anode film, evtl.
increase the anode surface
c) too high salt concentration:
analyse (especially carbonate
content)
dilute the electrolyte or freeze out
/ precipitate the carbonate
d) too low pH / hydroxide
concentration
adjust the pH with KOH to 11.5
e) low bath agitation improve the agitation
f) too low bath temperature heat up the electrolyte
anodes become black a) electrolyte contains silver dummy-plate on perforated
panels
no dissolution of the
anodes, Cu content
decreases
a) too low bath temperature heat up the electrolyte
b) too low concentration of free
cyanide
analyse and adjust
c) pH value too high decrease the pH adding tartaric
acid or KHSO3
d) too high carbonate content analyse and freeze out or
precipitate the carbonate

Ecology

Used solutions of SurTec 861 and its rinsing waters have to be worked up and disposed corresponding to national and local regulations. SurTec 861 I itself is not hazardous for water, Water Hazard Class 0; SurTec 861 II itself is slightly hazardous for water, Water Hazard Class 1 (self-assessment).

Product Safety

SurTec 861 I and II are not subject to classification according to General EC Classification Guidelines for Preparations.
Please consult also the EC safety data sheet.

Guarantee

Our guarantee extends to the continuous quality of our products as they leave our factory and not to their usage in the field. Our technical service will be pleased to answer any question you may have concerning operation and use of our products:
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