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PMD WHITE BRONZE LF

INTRODUCTION

The PMD White Bronze LF process has been developed to produce a bright white ternary copper-tin-zinc alloy, that is lead free with a colour similar to stainless steel.

The deposit is highly corrosion resistant, non-magnetic, having low porosity and coefficient of friction. It has the hardness of nickel, electrical characteristics of silver but with superior corrosion resistance under harsh conditions. As such it is eminently suitable for electrical contact applications.

It may also be used as a substitute for nickel in jewellery applications.

The process can be used for rack and barrel plating.

DESCRIPTION

The PMD White Bronze LF is a sodium based alkaline-cyanide electrolyte, that is operated with inert anodes. It has excellent throwing power with good metal distribution. Replenishment is made on an amp/time basis, via four carefully formulated liquid replenishers + additional sodium cyanide and sodium hydroxide as necessary, depending upon conditions of use.

During use there is a gradual increase in specific gravity as carbonate level increases. For this reason, a sodium based solution was chosen, in order that sodium carbonate could be frozen out and give economy in usage.

BENEFITS

Lead free.

High corrosion resistance.

Non-magnetic.

High electrical conductivity.

Excellent throwing power.

SOLUTION MAKE-UP

The PMD White Bronze LF solution is supplied ready for use for either rack or barrel plating.

INSTALLATION

The process tank must be thoroughly cleaned before use and leached overnight at 60°C with the following solution:

Sodium cyanide	20g/L
Sodium hydroxide	50g/L

The leach solution should then be discarded via the effluent system, as for cyanide waste.

Thoroughly rinse out process tank before adding white bronze solution.

SOLUTION COMPOSITION

	Optimum	Range
Copper	7.5g/L	7.3-7.7g/L
Tin	6.3g/L	6.1-6.5g/L
Zinc	1.4g/L	1.3-1.5g/L
Free sodium cyanide	43.0g/L	40-45g/L
Free sodium hydroxide	15.0g/L	14-16g/L
Sodium carbonate	25.0g/L min.	25-125g/L
S.G.	1.105 min.	1.105-1.180

OPERATING CONDITIONS

	Rack	Barrel
Temperature	60-63°C	60-63°C
Cathode current density	0.8-1.2A/sq.dm	0.5-0.8A/sq.dm
Anode current density	1.0-2.0A/sq.dm	1.0-2.0A/sq.dm
Anodes	Graphite	Graphite
Agitation	Moderate solution movement and work movement	Barrel and solution movement
Filtration	Essential	Essential

DEPOSITION RATE

Approximately	45% cathode efficiency at 0.8A/sq.dm 40% cathode efficiency at 1.2A/sq.dm
Rack	1 micron in 7 minutes at 1.2A/sq.dm
Barrel	1 micron in 8½ minutes at 0.8A/sq.dm

DEPOSIT DATA

Average alloy composition	Copper	55-60%
	Tin	25-30%
	Zinc	10-15%
Hardness	340-400DPN	
Density	8.0-8.2g/cm^3	

EQUIPMENT

Tanks	Plastic or plastic lined steel. Alkali-proof and heat resistant to 70°C.
Extraction	Essential.
Heaters	PTFE.
Anodes	Graphite.
Agitation	Work and solution movement (see notes).
Filtration	Continuous filtration (10 micron) 2-3 times tank volume per hour.

MAINTENANCE AND CONTROL

Because of the low metal concentration of this ternary alloy plating process, it is essential that the recommended maintenance procedure is rigidly adhered to.

Solution will need to be analysed regularly and maintained at following levels:

Copper	7.5g/L
Tin	6.3g/L
Zinc	1.4g/L
Free sodium cyanide	43.0g/L
Free sodium hydroxide	15.0g/L
S.G.	Monitor

Analytical control is carried out according to the analysis instructions for PMD White Bronze LF (separately available on request).

It is recommended that an ampere hour meter be installed, so that replenishment may be accurately adhered to.

Replenishment rates should be such that concentrations of all components are always maintained within the permissible ranges.

Ideally this would be via suitable metering pumps.

REPLENISHMENT

The solution composition is maintained by the addition of four balanced Replenishers - C, T, Z, RA, on an ampere minute basis. Additions of sodium cyanide, sodium hydroxide and ammonia may also be necessary.

The Replenishers have been formulated such that equal quantities of each are required, and as a general rule, a dosing rate of 60-90ml/1000 amp minutes is recommended. The specific replenishment rate for any installation will vary depending on current density, drag-out, nature of the work etc., but can be ascertained during production.

Replenisher C (100g/L copper)	10ml/L will increase copper concentration by 1.0g/L.
Replenisher T (50g/L tin)	10ml/L will increase tin concentration by 0.5g/L.
Replenisher Z (20g/L zinc)	10ml/L will increase zinc by 0.2g/L.

Replenisher RA contains brighteners and complexants

NOTES ON THE USE OF PMD WHITE BRONZE LF

Analysis

The free sodium cyanide and sodium hydroxide concentrations should be checked daily (depending on use), preferably before starting each day. See separate instruction sheet for analysis methods.

Agitation

It is important that, in rack plating, moderate and uniform agitation is used. This is best provided by work movement (5cm stroke 20/40 oscillations/minute) and solution movement via spargers suitably situated relative to the work. Pumping should be such that the bath volume is turned over 3-4 times per hour.

In barrel plating, solution movement is also recommended and should be designed such that solution depletion inside the barrel is minimised.

Filtration

Essential, preferably separate source to solution movement pump.

Current Density

Surface areas should be calculated carefully so that optimum current density is used. Otherwise, incorrect alloys will be obtained and solution imbalance will result.

Carbonate Formation

As with all alkaline/cyanide solutions there is a progressive increase in carbonate formation as the solution is used. PMD White Bronze LF is sodium based in order that carbonate may be frozen out periodically.

Cathode Efficiency

This is normally of the order of 40-45%, but will vary with changes in operating parameters, i.e. temperature, current density.

Post Treatment

a. Plate (White Bronze)
b. Rinse - fast running, 10 secs
c. Rinse c/f, 10-15 secs
d. Rinse c/f, 10-15 secs
e. ¼-½% v/v phosphoric acid dip, 2-3 mins
f. Rinse c/f
g. Rinse c/f
h. Passivation dip 3-4 mins
i. Rinse c/f
j. Rinse c/f
k. DI rinse - hot
l. Dry

It is essential that components are not left in plating tank, following plating, without current. Racks and barrels should be transferred through post rinse b, c, d, as quickly as possible consistent with good rinsing.

Passivation

It is recommended that the White Bronze deposit is given a passivation treatment to protect it from atmospheric sulphide and finger marking. PMD White Bronze Clear Passivate has been specially developed for this purpose (see separate Data Sheet).

Deposit Stripping

Defective deposits can be stripped from copper alloy substrates by simple immersion in Procirc 9361 Tin/Lead Stripper.

Trouble Shooting

Effect of variables and contaminants.

Guide separately available on request.

SAFETY DATA

ESSENTIAL INFORMATION

Cyanide must not be swallowed or inhaled nor should it come into contact with skin. Contact of these materials with acids, weak alkalis or strong oxidising materials will generate hydrogen cyanide gas which is extremely poisonous.

STORAGE

Store in a cool, dry place away from direct heat. Cyanide based products must not be stored in the same area as acids, weak alkalis or oxidising agents. No foodstuffs must be stored or consumed near these products.

HANDLING PRECAUTIONS

Approved eye protection **must** be worn and all reasonable precautions taken to avoid contact. (This is a UK mandatory requirement.) Wear protective clothing, rubber boots and gloves. Wear an approved dust respirator when handling solids or powders.

FIRST AID

Affected Eyes	Irrigate thoroughly with cool, clean water. Obtain medical attention immediately.
Skin Splashes	Drench with water. If clothing is contaminated, drench with water before removal. If the contamination is extensive, articles should be disposed of.
If Swallowed or if cyanide gas inhaled	Summon medical attention immediately but without delay carry out the first aid procedures detailed in the HMSO Cautionary Notice SHW 385. Remember: Speed Saves Lives.

SPILLAGE

If there is a possibility that cyanides have come into contact with acids, breathing apparatus must be worn.

Instruct all personnel to keep at a distance.

Solids	The product should be swept up and placed in a plastic container. Add water to dissolve the salt and then excess sodium hypochlorite solution to destroy the cyanide. The solution should be left for 24 hours and then run into the effluent disposal system.
Solution	Bleaching powder or sodium hypochlorite should be liberally scattered over the area. Spillage should then be mopped up and kept in a plastic container for 24 hours before it is run into the effluent disposal system.

DISPOSAL

Transfer to holding tank and add excess sodium hypochlorite solution. Cover and leave for 24 hours.

Run slowly to effluent treatment with excess water, consent to discharge limits apply.

PRODUCT FAMILIES

Product Name	Product Number
White Bronze LF Base Solution RFU	578010
White Bronze LF Replenisher C	578007
White Bronze LF Replenisher T	578008
White Bronze LF Replenisher Z	578009
White Bronze LF Replenisher RA	571004
White Bronze Clear Passivate	577008
Procirc 9361 Tin/Lead Stripper	937014