

PMD WHITE BRONZE

C60

INTRODUCTION

The PMD White Bronze C60 process has been developed to produce a highly corrosion resistant, non-magnetic, bright finish, eminently suitable for RF connectors.

It can also be used as a substitute for nickel in jewellery applications. The process can be used for rack and barrel plating.

SOLUTION MAKE-UP

The PMD White Bronze C60 Solution is supplied ready for use as:-

- (a) PMD White Bronze C60 Rack Solution R.F.U.
- or (b) PMD White Bronze C60 Barrel Solution R.F.U.

OPERATING CONDITIONS

	<u>Rack</u>	<u>Barrel</u>
Temperature	58 - 62°C	58 - 62°C
Cathode current density	0.8 - 1.2A/sq.dm*	0.5 - 0.8A/sq.dm*
Anode current density	1.5 - 2.0A/sq.dm	1.5 - 2.0A/sq.dm
Agitation	Moderate solution* movement and work movement	Barrel and solution movement.
Filtration	Recommended	

* See notes.

SOLUTION COMPOSITION

	<u>Rack</u>	<u>Barrel</u>
Copper	4.2 - 4.8g/l	5.1 - 5.5g/l
Tin	2.2 - 2.8g/l	1.9 - 2.3g/l
Zinc	1.8 - 2.2g/l	1.7 - 2.1g/l
Free potassium cyanide	62 - 68g/l	62 - 68g/l
Free potassium hydroxide	10 - 16g/l	10 - 16g/l
C60 Brightener	12 - 13m/l	12 - 13m/l

EQUIPMENT

Tanks	Rubber or plastic lined steel
Heaters	PTFE or titanium electric immersion heaters
Anodes	Platinised titanium or 316 stainless steel (18/8)

INSTALLATION

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

Potassium cyanide	20g/l
Potassium hydroxide	50g/l

The leach solution should then be pumped to the effluent plant and the tank thoroughly rinsed. The PMD White Bronze C60 can then be added to the tank.

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.

For a 500 litre bath the following additions should be made every 2000 ampere minutes:-

135ml.	Replenisher C
220ml.	Replenisher Z
13gm.	Replenisher T
280ml.	C60 Brightener

For different volume solutions this addition rate should be adjusted pro-rata e.g. for a 200 litre tank the additions should be made every 800 ampere minutes.

These additions will maintain the solution at approximately the correct concentrations, but depending on current density, drag-out, the nature of the work etc, the alloy deposit will vary slightly. It is essential, therefore, that the solution is analysed regularly (say every 50 ampere minutes/litre) and the composition adjusted to optimum, using the following guide:-

1.0ml/l	Replenisher C will increase the Copper concentration by 0.1g/l
6.2ml/l	Replenisher Z will increase the Zinc concentration by 0.1g/l
0.25gm/l	Replenisher T will increase the Tin concentration by 0.1g/l

MAINTENANCE AND CONTROL CONTINUED

Occasionally it may be necessary to adjust other bath components i.e. Stabiliser and Wetting agent, but these will be added only on PMD

Technical Department's recommendations.

ANALYSIS METHODS

Copper, tin, zinc contents (AAS)

Reagents

Hydrochloric acid conc.
5.00ppm copper standard
10.00ppm copper standard
1.00ppm zinc standard
2.00ppm zinc standard
25.00ppm tin standard
50.00ppm tin standard

Method

1. Pipette 10.0ml of the cooled working solution into a 1000ml volumetric flask.
2. In a fume cupboard add 100mls of conc hydrochloric acid and mix.
3. Make up to mark with deionised water. Label as solution (A).
4. Pipette 10mls of solution (A) into a 250ml volumetric flask and make up to the mark with deionised water.
5. Label as solution (B).
6. Using nitrous oxide/acetylene flame standardise AAS using tin standards and a blank.
7. Analyse solution (A) and record results as ppm tin.
8. Using air/acetylene flame, standardise AAS using the copper standards and a blank.
9. Analyse solution (B) and a record results as ppm copper.
10. Using air/acetylene flame, standardise AAS using the zinc standards and a blank.
11. Analyse solution (B) and record results as ppm Zn.

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Calculation

1. ppm tin x 0.1 = g/l tin
2. ppm copper x 2.5 = g/l copper

3. ppm zinc x 2.5 = g/l zinc

Replenishment

0.25gm/l Replenisher T will increase tin concentration by 0.1g/l

1.0ml/l Replenisher C will increase copper concentration by 0.1g/l

6.2ml/l Replenisher Z will increase zinc concentration by 0.1g/l

Brightener

Reagents

5.00ppm lead standard

10.00ppm lead standard

Method

1. Pipette 10ml of the cooled working solution into a 100ml volumetric flask.
2. Make up to the mark with deionised water.
3. Using air/acetylene flame standardise the AAS using lead standards and a blank.
4. Analyse dilution and record results as ppm lead.

Calculation

ppm lead x 2 = mls/l C60 Brightener

Replenishment

1ml/l C60 Brightener will raise Brightener concentration by 1ml/l

Free potassium cyanide

Reagents

0.1N silver nitrate (standard volumetric solution)

10% potassium iodide solution

Method

1. Pipette 5mls of cooled working solution into a 250ml conical flask.
2. Add 100mls deionised water and 2-3mls 10% potassium iodide solution.

3. Titrate with 0.1N silver nitrate solution until solution is turbid.
4. Record titre = t mls.

Calculation

$t \times 2.6 = \text{gm/l free potassium cyanide.}$

Potassium hydroxide

Reagents

0.1N hydrochloric acid (standard volumetric solution)
BDH 11-13 indicator

Method

1. Pipette 10mls of the cooled working solution into a 250ml conical flask.
2. Add 50mls of deionised water and 5-6 drops of BDH 11-13 indicator
3. Titrate with 0.1N hydrochloric acid to a yellow end point.
4. Record titre = t mls.

Calculation

$t \times 0.56 = \text{gm/l potassium hydroxide}$

DEPOSIT PROPERTIES

Alloy composition	Copper	58 - 62%
	Tin	20 - 24%
	Zinc	15 - 18%
Hardness	340 - 370 DPN	
Density	7.9 - 8.1gm/cc	

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DEPOSITION RATE

The process operates at approximately 45% cathode efficiency, and the following plating rates will be obtained at optimum conditions:-

Rack - 1 micron in 7½ minutes at 1.0A/sq.dm
Barrel - 1 micron in 10 minutes at 0.75A/sq.dm

NOTES ON THE USE OF PMD WHITE BRONZE C60

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.

Current density - Surface areas should be calculated exactly so that the optimum current density is used. Otherwise incorrect alloys will be obtained and solution imbalance will result.

Brightener - C60 Brightener deficiencies will cause yellow streaking, while an excess will produce brittle deposits. Excess C60 Brightener can be readily be removed by plating out at 1.5 - 2.0A/sq.dm.

Cathode efficiency - The cathode efficiency under normal operating conditions is approximately 45%, but will vary with changes in operating parameters as follows:-

Increased efficiency	-	high temperature low current density
Decreased efficiency	-	low temperature high current density

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

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.

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.

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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.

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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

The following products are referred to in this data sheet:-

Product Name

Product Number

White Bronze C60 Rack Solution R.F.U.	578001
White Bronze C60 Barrel Solution R.F.U.	578004
White Bronze C60 Replenisher C	578002
White Bronze C60 Replenisher Z	578003
White Bronze C60 Replenisher T	576001
White Bronze C60 Brightener	575001
White Bronze C60 Stabiliser	572002
White Bronze C60 Wetting Agent	571003
Procirc 9361 Tin/Lead Stripper	937014
White Bronze Clear Passivate	577008

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