

# PMD PYROBRITE BRIGHT PYROPHOSPHATE COPPER

## INTRODUCTION

PMD Pyrobrite produces bright copper deposits with excellent levelling over a wide current density range. Base metals such as mild steel, tin/lead or zinc can be plated providing they are first flash coated with a cyanide copper deposit. The solution is easy to control using one liquid additive.

## BENEFITS

Excellent levelling

Bright deposits

## SOLUTION MAKE-UP

Copper Pyrophosphate	70g/L
Potassium Pyrophosphate	250g/L
Ammonia Solution 0.88 S.G.	3.75ml/L
Pyrobrite Make Up	2.5ml/L
Pyrobrite Brightener	0.25ml/L

## OPERATING DATA

	<u>Optimum</u>	<u>Range</u>
Copper	24g/L	20-30g/L
Total Pyrophosphate	165g/L	130-225g/L
Ammonia	0.9g/L	0.8-1.0g/L
pH	8.9	8.6-9.2
Ratio Pyrophosphate/Copper		6.4:1 to 7.5:1
Temperature	55 deg C	50-60 deg C
Current density	4.0 A/dm <sup>2</sup> (40 A/ft <sup>2</sup> )	3.5-5.5 A/dm <sup>2</sup> (35-55 A/ft <sup>2</sup> )
Agitation	Vigorous air	
Voltage	3 to 8 volts	
Extraction	Recommended	

**PYROBRITE – 06/05  
ISSUE 3**

**EQUIPMENT**

Tanks	Polypropylene, PVC, Lined steel tanks.
Heating	PTFE or titanium clad electric immersion heaters.
Agitation	Vigorous low pressure air through plastic agitation pipes.
Filtration	Continuous with a minimum of one solution turn-over per hour.
Anodes	OFHC copper with titanium hooks or copper pieces in titanium anode baskets

**INSTALLATION**

It is essential that the equipment to be used for PMD Pyrobrite is cleaned and leached before any product is introduced.

If in any doubt as to the cleaning procedure contact PMD (UK) Ltd., Technical Department.

1. Three-quarters fill the tank with DI water and heat to 45°C.
2. Add the potassium pyrophosphate followed by the copper pyrophosphate while stirring. These materials should be added in small quantities to avoid any excessive rise in temperature.
3. Dilute the required volume of ammonia 50% with DI water and add to the tank.
4. Check pH and adjust to 8.6 with 50% sulphuric acid.
5. Filter the solution until clear.
6. Dilute the Pyrobrite Brightener 1 to 10 with DI water.
7. Add the required amounts of Pyrobrite Make Up and diluted Brightener.
8. Fill the tank to operating level with DI water.
9. Re-check the pH and adjust if necessary.
10. Heat to operating temperature.

**PYROBRITE – 06/05  
ISSUE 3**

**MAINTENANCE AND CONTROL**

The solution should be regularly analysed for copper, pyrophosphate, ammonia and pH. See analysis methods.

To reduce the pH use 10% Sulphuric Acid. To raise the pH use 20% w/v Potassium Hydroxide solution.

Pyrobrite Make Up is added on make up only.

Pyrobrite Brightener should be added at the rate of 200ml/1000 amp hours. Dilute the brightener to 10% with DI water before adding to the tank. Additional Brightener maybe required after idle periods.

Ammonia content can be controlled with an ammonia test kit after the required dilution. A test kit such as MERCK 1.146557.0001 0.5-10 mg/l ammonia is suitable.

**ANALYSIS METHODS**

1. Determination of Copper Content

Reagents

Glacial acetic acid

Potassium fluoride

0.1N Potassium permanganate (standard volumetric solution)

Potassium iodide solid

0.1N Sodium thiosulphate (standard volumetric solution)

Iodine indicator

Method

1. Pipette 5ml of cooled solution into a 400 ml conical flask.
2. Add one or two drops of 0.1N potassium permanganate until the colour deepens.
3. Add 0.5gm potassium fluoride.
4. Dilute to 50ml with DI water.
5. Add 10ml acetic acid and 10gm of potassium iodide.
6. Titrate immediately with 0.1N sodium thiosulphate until the brown colour turns to pale yellow.
7. Add iodine indicator and continue titration to a clear blue end point.
8. Record titre = t mls.

Calculation

$t \times 1.271 = \text{g/L copper}$

Replenishment

For every 1g/L copper required add 2.82g/L copper pyrophosphate.

**PYROBRITE – 06/05  
ISSUE 3**

2. Determination of Total Pyrophosphate

Reagents

1.0N sulphuric acid (standard volumetric solution).  
0.1N sulphuric Acid (standard volumetric solution).  
0.1N sodium hydroxide (standard volumetric solution).  
Mixed indicator – make up 0.050% w/v methyl red and 0.036% w/v  
bromocresol green in a 50% methanol solution.  
Sodium dithionite solid  
Formaldehyde solution 40% w/w  
Zinc sulphate solution (100g/L aqueous)

Method

1. Pipette 10ml of the cooled plating solution in to a 250ml conical flask.
2. Add 1ml of the mixed indicator.
3. Titrate with 1N sulphuric acid to a purple colour.
4. Add 1 gm sodium dithionite and heat to boiling. Allow to cool.
5. Transfer to a 250 ml volumetric flask and top up to the mark with DI water.
6. Filter through a no. 542 filter paper.
7. Pipette 50ml of the filtrate in to a 400ml conical flask.
8. Add 10ml of formaldehyde solution.
9. Allow to stand for 15 minutes.
10. Dilute to 100 ml with DI water.
11. Add 1.5ml mixed indicator.
12. Viewing against a white background add 0.1N sodium hydroxide until a blue colour is reached.
13. Add 0.1N sulphuric acid until a red colour just forms.
14. Add 30ml of the zinc sulphate solution and allow to stand for 10 minutes with occasional stirring.
15. Add 0.5ml mixed indicator
16. Titrate with 0.1N sodium hydroxide until the solution turns blue. Record titre = A mls.
17. Titrate with 0.1N sulphuric acid until a pink colour first forms. Record titre = B mls.

Calculation

$(A - B) \times 4.35 = \text{g/l total Pyrophosphate}$

Replenishment

For every 1g/L total Pyrophosphate required add 1.9g/L potassium pyrophosphate.  
Note, If copper pyrophosphate is also required this must be taken into consideration when adding the potassium pyrophosphate as follows:

$$\begin{aligned} & [\text{g/l total pyrophosphate required} - (\text{g/l copper pyrophosphate required} \times 0.48) ] \times 1.9 \\ & = \text{g/l potassium pyrophosphate required} \end{aligned}$$

**PYROBRITE – 06/05  
ISSUE 3**

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**DISPOSAL**

Dispose of in accordance with local authority requirements.

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**PRODUCT FAMILIES**

The following products or product families are referred to in this data sheet.

<u>Product Name</u>	<u>Product Number</u>
Pyrobrite Make up	565001
Pyrobrite Brightener	565002
Copper Pyrophosphate	MC415
Potassium Pyrophosphate	MC414

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