

PMD (UK) LTD PROCESS DATA

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ISSUE 2
PREV 1

DECOCHROME

INTRODUCTION

Decochrome is a high speed decorative chromium plating process. Decochrome Catalyst is supplied as a liquid which is added to chromic acid solution.

BENEFITS

- Wide current density range
- High cathode efficiency
- Excellent activation of nickel
- Ease of control
- Economical

SOLUTION MAKE-UP

Decochrome Catalyst can be used in plating solutions of varying chromic acid concentrations as follows:

Chromic acid	150g/L	225g/L	300g/L	(See NOTES)
Decochrome Catalyst	9ml/L	14ml/L	18ml/L	
Sulphuric acid	0.75g/L	1.125g/L	1.5g/L	
Spray Suppressant		2-3ml/L		

OPERATING DATA

- Current density 10-15 amps/sq.dm. (See NOTES)
- Temperature 35 - 50°C. (See NOTES)
- Time 3-5 minutes

EQUIPMENT

Tanks	Steel, lined with PVC or polypropylene.
Heaters	PTFE, lead alloy or tantalum immersion with thermostatic control.
Extraction	Mandatory, in conjunction with Spray Suppressant.
Agitation	Solution agitation is necessary to ensure uniform temperature and avoid layering. It is also useful for mixing the solution after additions, topping up with water etc.
Rectifier	9-18 volts with maximum 5% ripple.
Anodes	4% tin/lead

INSTALLATION

It is essential that the tanks to be used for Decochrome are thoroughly cleaned and leached before any product is introduced. For new tanks or linings extended warm leaching is required.

If in any doubt as to the cleaning procedure please contact PMD (UK) Ltd technical department.

1. Remove anodes and ancillary equipment (coils, thermostats, etc) to allow thorough cleaning of tank by scrubbing walls and bottom.
2. Rinse thoroughly with water.
3. Fill the tank to approximately 70% of required final volume and heat to approximately 50°C.
4. Add the calculated quantity of chromic acid and stir to dissolve.
5. Add the Decochrome Catalyst and mix thoroughly.
6. Analyse for sulphate and add sulphuric acid accordingly.
7. Add Spray Suppressant.
8. Replace anodes and electrolyse using dummy cathodes for 3-4 hours at required plating temperature (see NOTES).

MAINTENANCE AND CONTROL

The chromic acid concentration can be estimated from the specific gravity of the solution, using the table below. For every kilogram of chromic acid added, 60ml of Decochrome Catalyst should be added.

The specific gravities shown in the table are for new solutions. As contaminants build up in the solution the S.G will not be a true measure of the chromic acid concentration and periodic chemical analysis is recommended.

Regular analysis for sulphate is recommended and a ratio of 200:1, chromic acid : sulphate should be maintained. (See NOTES).

Periodic analysis of Decochrome Catalyst will be carried out by PMD Technical Department.

<u>SPECIFIC GRAVITY OF CHROMIC ACID SOLUTION</u>		
<u>Chromic acid g/L</u>	<u>S.G.</u>	<u>Degrees Bé</u>
130	1.090	11.97
150	1.105	13.78
170	1.120	15.54
190	1.135	17.25
210	1.147	18.42
230	1.160	20.00
250	1.175	21.60
270	1.190	23.15
290	1.202	24.20
310	1.215	25.66

(Measured at 16°C)

Anodes

It may be necessary to remove insulating scale from some anodes. This can be done by scrubbing while wet. If the solution is left idle for an extended period (over shut-down etc) the anodes should be removed and left suspended in air. When plating begins again they should be electrolysed to re-form the brown film.

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NOTES ON THE USE OF DECOCHROME

- Chromic acid concentration - The Decochrome process can be used between 150 and 300g/L chromic acid. Lower concentrations should be used where drag-out of hexavalent chromium must be minimised. Higher concentrations will be necessary to maintain performance as metallic contamination builds up.
- Current density - The optimum range is 10-15A/sq.dm but this can be varied depending on the simplicity or complexity of the work to be plated.
- Temperature - The high end of the recommended range (35-50°C) will allow higher maximum current densities and thus faster plating speeds. Lower temperature will give better covering power.
- Sulphate - A ratio of 200:1, chromic acid : sulphate should be maintained. High sulphate will cause poor throwing power and should be reduced by additions of barium carbonate as shown in the table below.

<u>BARIUM CARBONATE ADDITIONS TO REDUCE SULPHATE LEVEL</u>				
	gm. barium carbonate required			
<u>g/L sulphate to be removed</u>	<u>250L</u>	<u>500L</u>	<u>750L</u>	<u>1000L</u>
0.1	50	100	150	200
0.2	100	200	300	400
0.3	150	300	450	600
0.4	200	400	600	800
0.5	250	500	750	1000

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ANALYSIS METHODS

1. Hexavalent Chromium

Reagents

50% v/v sulphuric acid

0.1N ferrous ammonium sulphate

0.1N potassium permanganate (standard volumetric solution)

Method

1. Pipette 40ml of 0.1N ferrous ammonium sulphate into a 250ml conical flask.
2. Add 50ml DI water and 10ml 50% sulphuric acid.
3. Titrate with 0.1N potassium permanganate to pink end point.
4. Record titre = A mls.
5. Pipette a 10ml aliquot of the plating solution into a 500ml volumetric flask and make up to the mark with DI water.
6. Mix thoroughly.
7. Pipette 10ml of this dilution into a 250ml conical flask.
8. Add 50ml DI water and 10ml 50% sulphuric acid.
9. Pipette 40ml 0.1N ferrous ammonium sulphate into the flask.
10. Titrate with 0.1N potassium permanganate to a pink end point.
11. Record titre = B mls.

Calculation

$(A - B) 16.64 = \text{g/L chromic acid}$

Replenishment

For every 1g/L required add 1g/L chromic acid and 0.06ml/l Decochrome Catalyst.

2. Sulphuric acid (sulphate)

Reagents

Conc. hydrochloric acid

Hydrogen peroxide solution

30% barium chloride solution

5% v/v hydrochloric acid

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Method

1. Filter a sample of the working solution.

2. Pipette a 10ml aliquot of the filtered solution into a 500ml beaker.
3. Add 20ml DI water and 20ml conc. hydrochloric acid.
4. Add hydrogen peroxide dropwise until no further effervesence is seen and the solution is a blue-green colour.
5. Heat to boiling and add 2ml of 30% barium chloride solution.
6. Continue boiling for 2 mins.
7. Add 200mls boiling DI water and continue boiling for 2 hours.
8. Allow to stand overnight.
9. Filter into a Whatman 542 filter paper.
10. Bobby out the beaker and rinse into filter with hot DI water.
11. Rinse beaker into filter paper with hot 5% hydrochloric acid.
12. Rinse filter with hot DI water until paper is clean.
13. Weigh a dried crucible and record weight as 'A' gms.
14. Transfer paper to the crucible and burn off in furnace for 1 hour at 800°C.
15. Ensure no carbon residues remain in the crucible.
16. Transfer crucible to a dessicator and allow to cool.
17. Weigh the crucible and record weight as 'B' gms.

Calculation

(B-A) 42.02 = g/L sulphuric acid (sulphate).

Replenishment

For every 1g/L low add 0.54ml/L sulphuric acid.

DISPOSAL

Dispose of in accordance with local authority requirements.

PRODUCT FAMILIES

The following products are referred to in this data sheet.

<u>Product Name</u>	<u>Product Number</u>
Decochrome Catalyst	417001
PMD Spray Suppressant	411001

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