

NI-PHOS 2400

NICKEL-PHOSPHOROUS ALLOY PLATING

INTRODUCTION

The Ni-Phos 2400 is a single additive process for nickel alloy plating. The alloy ratio can be adjusted by the concentration of additive and current density. The process can be used for rack, barrel and high speed plating. Phosphorous content can be varied between 2 and 14%

BENEFITS

- Excellent corrosion resistance
- Single additive
- Semi-bright finish

SOLUTION MAKE -UP

The Ni-Phos 2400 can be used with both sulphate and sulphamate baths.

Component	Nickel sulphate bath	Nickel sulphamate bath	Nickel sulphate bath (high speed)	Nickel sulphamate bath (high speed)
Nickel sulphate	280g/l	-	525g/l	-
Nickel sulphamate solution	-	390ml/l	-	500ml/l
Nickel chloride	50g/l	10g/l	10g/l	-
Boric acid	45g/l	45g/l	35g/l	35g/l
Ni-Phos 2400 wetter	3ml/l		-	3ml/l
Ni-Phos 2400 Additive	100-150ml/l (Rack) 50ml/l (barrel)		100-150ml/l	50-100ml/l

It is essential that the tanks to be used for Ni-Phos 2400 are thoroughly cleaned and leached before any product is introduced.

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

1. Add DI to tank and heat to 60°C.
2. Add salts and agitate to fully dissolve.
3. Heat to operating temperature.
4. Add Ni-Phos 2400 Wetter and Additive

OPERATING DATA

Nickel sulphate bath

	Rack and barrel	High speed
Nickel	60 – 90g/l	100 – 150g/l
Chloride	10 – 20g/l	2 – 8g/l
Boric acid	40 – 50g/l	30 – 40g/l
pH	1.0 – 1.5	
Temperature	50 – 70°C	60 – 70°C
Cathode cd	1 – 5 asd (rack) 0.2 – 1.0 asd (barrel)	10 – 40asd
Anode cd	<3asd	
Agitation	Air, cathode or solution movement	
Cathode efficiency	70% (100ml/l Additive, 4 asd), 40% (40ml/l Additive, 0.5asd)	
Anodes	'S' Nickel in titanium baskets. Polypropylene or Terylene woven anode bags.	

Nickel sulphamate bath

	Rack and barrel	High speed
Nickel	60 – 90g/l	80 – 100g/l
Chloride	2 – 8g/l	-
Boric acid	40 – 50g/l	30 – 40g/l
pH	1.0 – 1.5	
Temperature	52 – 56°C	
Cathode cd	1 – 5 asd (rack) 0.2 – 1.0 asd (barrel)	10 – 40asd
Anode cd	<3asd	
Agitation	Air, cathode or solution movement	
Cathode efficiency	70% (100ml/l Additive, 4 asd), 40% (40ml/l Additive, 0.5asd)	
Anodes	'S' Nickel in titanium baskets. Polypropylene or Terylene woven anode bags.	

EQUIPMENT

Tanks	Polypropylene or UPVC.
Heaters	PTFE or titanium clad electric immersion heaters.
Filtration	Continuous filtration recommended through 3-5µm cartridge.
Extraction	Required



MAINTENANCE AND CONTROL

The solution should be analysed regularly and replenished as necessary. (See analysis methods)

The Ni-Phos 2400 Additive is added on an amphour basis of 2 litre per 1000 Amphour.

pH should be kept within the range with additions of sulphuric acid (10% v/v) (sulphate bath) or sulphamic acid (sulphamate bath) to lower or sodium hydroxide (100g/L) to increase.

ANALYSIS METHODS

1. Chloride

Reagents

0.1N silver nitrate (standard volumetric solution)
Sodium hydrogen carbonate
20% w/v potassium chromate solution

Method

1. Cool a sample of the solution to room temp.
2. Pipette a 5.0ml aliquot into a 250ml conical flask.
3. Add 100ml DI water.
4. Add 2gm sodium hydrogen carbonate and stir until dissolved.
5. Add 2-3 drops 20% potassium chromate solution.
6. Titrate with 0.1N silver nitrate to an orange end point.
7. Record titre = t mls.

Calculation

$t \times 0.71 = \text{g/l chloride}$

2. Nickel

This analysis method should be carried out after any additions of nickel chloride have been made.

Reagents

0.2N EDTA (Standard volumetric solution)
Ammonia solution
Murexide indicator



Method

1. Cool a sample of the solution to room temperature.
2. Pipette a 2.0ml aliquot into a 250ml conical flask.
3. Add 100ml DI water.
4. Add 10ml ammonia solution.
5. Add a pinch of murexide indicator.
6. Titrate to a purple end point with 0.2N EDTA.
7. Record titre = t mls.

Calculation

$$t \times 2.935 = \text{g/L Nickel}$$

3. Boric acid

Reagents

0.1N Sodium Hydroxide (standard volumetric solution)

0.1N Hydrochloric acid (Standard volumetric solution)

Mannitol

Mixed indicator (1g bromocresol purple, 0.2g bromothymol blue in 100ml alcohol)

Method

1. Warm solution to 60°C and ensure all boric acid is dissolved.
2. Pipette a 2ml sample of the bath in to a 250ml conical flask.
3. Add 50ml DI water and 3-4 drops mixed indicator.
4. If the solution is yellow titrate with 0.1N sodium hydroxide until the colour changes. If the solution is blue titrate with 0.1N hydrochloric acid until the colour changes.
5. Add 1.5g mannitol.
6. Titrate with 0.1N sodium hydroxide to a purple end point.
7. Record titre = t mls

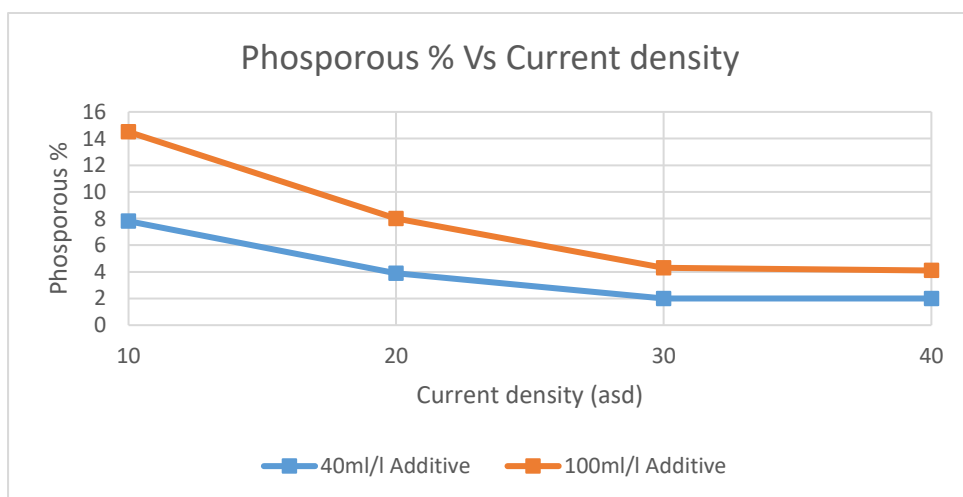
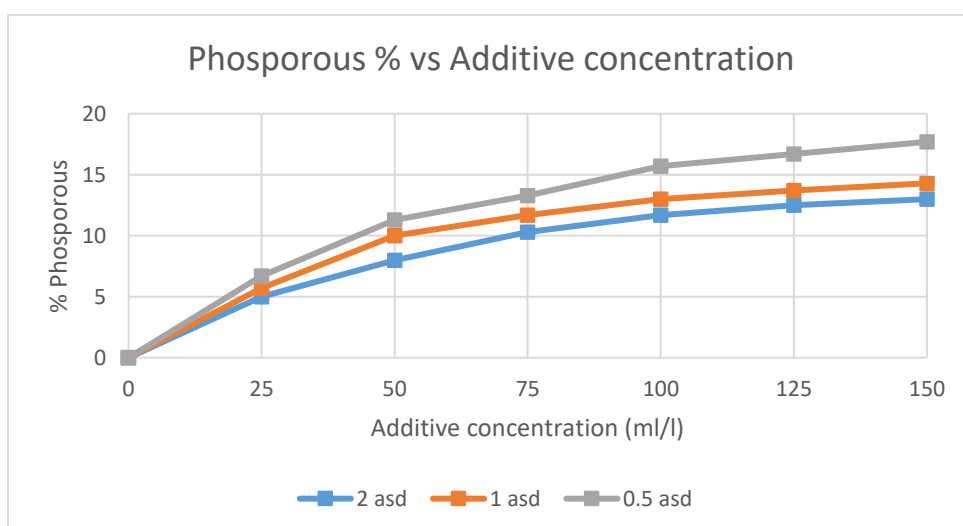
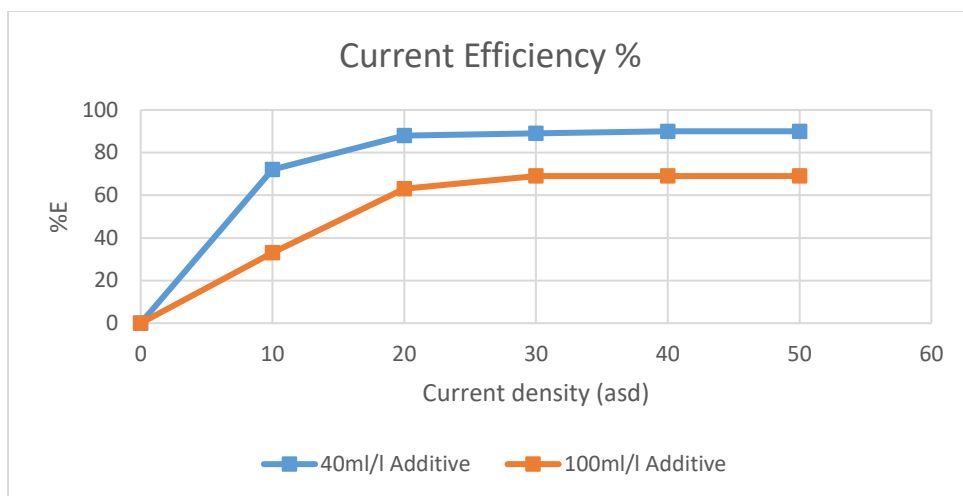
Calculation

$$t \times 3.09 = \text{g/L boric acid}$$

NOTES

Ni-Phos 2400 can be controlled by analysis.

1. Phosphorous content can be controlled by current density and concentration of the Additive
2. Lower current density will give higher phosphorous content of the deposit.
3. To reduce foam in barrel plating up to 2ml/l wetter can be added.



DISPOSAL

Dispose of in accordance with local authority requirements

PRODUCT FAMILIES

The following products are referred to in this data sheet.

PRODUCT NAME	PRODUCT NUMBER
Ni-Phos 2400 Additive	
Ni-Phos 2400 wetter	

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