



NI-STAR TPE

PTFE ELECTROLESS NICKEL

INTRODUCTION

Ni-star TPE is a state of the art phosphorus electroless nickel-plating process which incorporates PTFE in the deposit matrix. The process is designed to produce a consistent amount of uniformly dispersed PTFE throughout the deposit.

BENEFITS

- Uniform distribution of PTFE particles
- Lead, Cadmium and Ammonia free
- Long solution life
- Fast plating speed
- Excellent wear resistance and high lubricity

SOLUTION MAKE -UP

Ni-Star TPE Part 1	60ml/L
Ni-Star TPE Part 2	150ml/L
Ni-Star TPE Dispersion	5g/L

It is essential that the tanks to be used for NI-STAR TPE Electroless Nickel are thoroughly cleaned and leached before any chemistry is introduced.

Contact PMD Technical Department for appropriate procedure.

1. Half fill the clean empty tank with DI water.
2. Add the required volume of NI-STAR TPE Part 1.
3. Add the required volume of NI-STAR TPE Part 2
4. Make up to the operating volume with DI water.
5. Mix thoroughly.
6. Heat solution to operating temperature.
7. Check and adjust pH if required.
8. Add Ni-star TPE Dispersion and mix well.

OPERATING DATA

Nickel (g/L)	5.5 – 6.5 Optimum 6.0
Hypophosphite (g/L)	27 – 33 Optimum 30
pH	4.6 – 5.2 Optimum 4.9
Temperature (°C)	82 – 94 Optimum 88
Plating rate (µm/Hr)	5 - 10
Bath loading (dm ² /L)	0.5 – 1.7
Extraction	Essential
Agitation	Air is not recommended. Continuous mild solution movement even when not in use. This helps prevent agglomeration of PTFE particles.

EQUIPMENT

Tanks	Polypropylene.
Heaters	Steam heater of stainless steel, titanium or Teflon. PTFE/Teflon immersion heater may also be used. Thermostatic control should maintain the temperature to +/-1°C
Filtration	Not normally required. If filtration is used 25µm or greater filter is recommended to prevent the PTFE from being filtered out.

MAINTENANCE AND CONTROL

The solution should be analysed regularly and maintained at the optimum concentrations detailed under operating data.

Nickel analysis is used as a basis of maintaining the additions of Ni-Star TPE Part 1, Ni-Star TPE Part 3 and Ni-Star TPE Dispersion.

Upon determination of the nickel metal concentration, additions of Ni-Star TPE Parts 1, 3 and Dispersion are made in a 1:1.5:0.07 ratio based on the following replenishment guide.

Analysis			Additions		
Titre	Nickel	Activity	mls/L Ni-Star TPE Part 1	mls/L Ni-Star TPE Part 3	g/L Ni-Star TPE Dispersion
5.1	6.0	100%	0	0	0
5.0	5.9	98%	1.3	2.0	0.09
4.9	5.8	96%	2.5	3.7	0.17
4.8	5.6	94%	3.6	5.5	0.26
4.7	5.5	92%	4.8	7.0	0.34
4.6	5.4	90%	6.0	9.0	0.42
4.5	5.3	88%	7.2	10.8	0.50
4.4	5.2	86%	8.3	12.5	0.58
4.3	5.0	84%	9.5	14.3	0.67
4.2	4.9	82%	10.7	16.0	0.75
4.1	4.8	80%	11.9	17.8	0.83
4.0	4.7	78%	13.0	19.6	0.91
3.9	4.6	76%	14.2	21.3	0.99

pH - The replenishment chemistry should maintain the pH within the specified range. If it is necessary to adjust use Ni-Star pH Adjuster to increase the pH or a 10% v/v solution of sulphuric acid to reduce it.



Notes

1. To provide optimum plating conditions it is preferable to make frequent additions.
2. A complete solution replenishment is achieved when 60mls per litre additions of Ni-Star TPE Part 1 have been made.
3. It is unwise to operate below 90% strength. Should this occur then make several additions to restore optimum operating conditions. Failure to keep the bath at optimum can lead to instability and shorten life of the bath. Large additions may lead to over stability of the bath.
4. The amount of Ni-Star TPE Dispersion required to maintain both deposit colour and PTFE content may vary from installation to installation and with bath age.
5. Deposits may exhibit a white powdery film on the surface. If required it can be removed by baking at 315°C for 20 mins, which reflows the PTFE in to the deposit. Alternatively it can be removed by wiping with solvent or anodic cleaning.
6. This type of bath does not offer corrosion protection. It is recommended to apply over a high phosphorus EN, such as Ni-Star HP when this is required.

ANALYSIS METHODS

1. Nickel Concentration

Reagents

0.1M EDTA (standard volumetric solution)

50% ammonia solution

Murexide indicator

Method

1. Pipette 5.0mls of bath (previously cooled) into a conical flask.
2. Add 50mls of DI water.
3. Add approximately 10mls 50% ammonia solution.
4. Add a small spatula tip of murexide.
5. Titrate against 0.1 M EDTA solution to a purple end point.
6. Record titre = t mls.

Calculation

$t \times 1.174 = \text{g/L Nickel.}$

Replenishment

Refer to table in Maintenance and Control for appropriate additions.



2. Sodium Hypophosphite

Reagents

0.1N iodine (standard volumetric solution)

Concentrated hydrochloric acid

0.1 N sodium thiosulphate (standard volumetric solution)

Iodine indicator solution

Method

1. Pipette 5.0mls of bath (previously cooled) into an iodine flask.
2. Add approximately 50mls DI Water.
3. Add 50mls concentrated hydrochloric acid.
4. Pipette 50.0mls 0.1N iodine into flask. Stopper flask and shake.
5. Leave in a dark cupboard for 30 minutes.
6. Titrate with 0.1 N sodium thiosulphate to a pale straw colour.
7. Add a few drops of iodine indicator and continue titration to a clear end point.

Calculation

$(50 - t) \times 1.06 = \text{g/L sodium hypophosphite.}$

Replenishment

For every 1g/L required add 3.3ml/L Ni-star TPE Part 3.

EQUIPMENT MAINTENANCE

Good housekeeping in electroless nickel plating is essential. All electroless nickel processes are sensitive to contamination such as metals, sulphur compounds and particulate matter such as dust. Great care should be taken to avoid contamination.

It is good practice to pump the solution out through the filter each day and wash the tank out. Once a week (or more often if required) carry out the full stripping procedure as described below.

When not in use the solution should be covered to reduce evaporation losses and contamination.

STRIPPING PROCEDURE

When preparing brand new equipment fill the tank with fresh 50% v/v nitric acid and pump round the system for a minimum of 8 hours. This passivates stainless steel and leaches out soluble organics from plastic equipment. This should be followed by a thorough washing as indicated below.



Used tanks should be stripped regularly as follows;

1. Transfer the solution to spare tank.
2. Remove and clean filter bags.
3. Rinse and pump water round the equipment.
4. Fill the tank with 50% nitric acid.
5. Circulate the acid to ensure that all surfaces are contacted.
6. Leave overnight to strip nickel deposits which may have built up.
7. Pump acid to storage or effluent.
8. Wash out tank and circulate water round system thoroughly.
9. Drain tank.
10. Fill tank with deionised water and circulate.
11. Drain tank.
12. Fit new filter.
13. Return nickel solution to tank, make up to volume with deionised water and analyse.

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-STAR TPE PART 1	557052
NI-STAR TPE PART 2	557053
NI-STAR TPE PART 3	555004
NI-STAR TPE DISPERSION	551010

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