

GIT-702 bright nickel & GIT-ZIMAX processes

GIT-702 process is an ultra high performance addition agent system for bright nickel plating. The process has been formulated to give with leveler **GIT-L900** superior levelling, brightness, coverage, better chrome receptivity and extremely good brightness at medium and low current density areas.

- For rack applications
- Low formation of undesirable decomposition products
- Easy handling
- Individually adjustable with regard to brightness and levelling
- Very good brightness throwing power
- Excellent ductility
- Very light nickel deposition
- Can be easily chrome-plated

FEATURES BENEFITS OF GIT-702

Features

GIT-702 produces the ultimate in levelling.

GIT-702 builds brightness faster

GIT-702 has a wide bath chemistry

GIT-702 is very receptive to chrome overplate.

GIT-702 employs only two addition agents

Benefits

Shorter plating time required. Fewer polishing operations required.

Less deposit thickness for the desired finish.

Will deposit over a wide range of operating conditions.

Fewer rejection due to misplates and passive nickel deposits.

Fewer materials to add low inventory cost.

SOLUTION COMPOSITION AND OPERATING CONDITIONS

	RANGE	OPTIMUM
RACK BRIGHT NICKEL SALT	: 250-400 g/l	350 g/l
ADDITIVE GIT-ZIMAX	: 5.0 – 7cc/l	6.0 cc/l
LEVELER GIT-L900	: 0.8 – 1.2 cc/l	1.0 cc/l
BRIGHTNER GIT-702	: 0.5-0.7 cc/l	0.6 cc/l
GIT-WETTING AGENT , Rack/Air	: 6 - 10 cc/l	6.0 cc/l

OPERATING CONDITIONS

PH	4.5-4.9	4.6
Temperature	50-65 °C	55 °C
Cathode Current Density	2.0-6.0 A/sq.dm.	4.0 A/sq.dm.
Anode Current Density	1.0-3.0 A/sq.dm.	2.0 A/sq.dm.
Agitation	Cathode rod	Air/Low pressure air
Filtration	Continuous	

The optimum bath composition depends upon the particular requirements unique to the processing equipment and the parts to be plated. This includes Cathode Current Density type and finish of basis metal plated; deposit thickness; part geometry and so on. Similarly, addition agents consumption also varies depending upon the above mentioned factors.

Brightener, softener, leveler and wetting agent are continuously consumed during the electrolytic process. The following amounts per 10.000 Amh. may serve as not binding information:

GIT-702	0.8 – 1.2 l depending on the desired finish
LEVELER GIT-L900	1.2 – 1.4 l
ADDITIVE GIT-ZIMAX	2.0 – 2.4 l
Wetting agent (rack or air)	approx. 0,5 – 0.6 l

Analysis methods may be sent on demand.

Product specifications:

Product name	Density	PH	Safety
GIT-702	1.05–1.06 g/ml	4.6 – 5.5	In case of contact with skin wash with water
LEVELER GIT-L900	1.05–1.06 g/ml	6.0 -6.5	In case of contact with skin wash with water
ADDITIVE GIT-ZIMAX	1.08–1.10 g/ml	6.0 -6.5	In case of contact with skin wash with water
Wetting agent (rack or air)	1.005–1.006 g/ml	6.7 -7.0	In case of contact with eye wash with water

SOLUTION PREPARATION

Fresh nickel solution is prepared as under

- 1) Leach a new rubber lined tank and fill with 5% Sulphuric acid (by volume) and 1ml/l of Waiting agent at 50-60 °C Agitate the solution for 2-3 hours maintaining the temperature at 70 °C. The dilute acid is allowed to stand Overnight. Afterwards, the tank is cleaned with water and mixed with Wetting agent at the rate of 2ml/ltr and then flushed with clean water.
- 2) Fill the plating tank two-third full of water, softened or demineralized. Heat to a temperature of 65-75C
- 3) Add the calculated quantity of Rack Bright Nickel salt; stir vigorously until completely dissolved.
- 4) Dilute the solution to the working level and adjust the pH value to 2.5 -3.5 with pure sulphuric acid (25%volume). For dilution of sulphuric acid always add the acid in water with stirring and cooling.
- 5) Suspend a few nickel anodes on the bars and as many dummy Cathodes as possible from the cathode bars. Electrolyse solution at 3 amps per sq.ft. for 12-24 hours with vigorous air agitation to remove metallic impurities. Remove the anodes and dummy plates.
- 6) Pump the hot solution to the storage tank and add sufficient Nickel Carbonate slurry and stir the solution vigorously to raise the pH value to 5.0-5.5 and add 2ml per ltr(100 vol) hydrogen peroxide. Stir vigorously at 60-70 °C for two hours.

- 7) Add 2 gm/ltr activated carbon and 1gm/ltr filter aid; air agitate or stir the solution vigorously for 2 hours.
- 8) Allow the solution to stand overnight to enable the carbon and other residues to settle.
- 9) Filter the solution back into the clean plating tank, taking care not to disturb the layer of sludge at the bottom of the tank.
This solution is in a purified condition and ready for the addition of brightener. After these additions and the final adjustment of the pH value the solution is ready for use.

NICKEL PLATING TANK

The plating tank should be of mild steel and should be lined with an approved grade of semi hard or hard rubber. The quality of the rubber is very important for good performance of solution and hence it is advisable to consult the Laboratory/Local Representative before getting the tank line. Thermal lagging is recommended though not essential, as it is already insulated by rubber lining.

MIXING AND PURIFICATION TANK

This tank is meant for the preparation and purification of solution. This tank is suitably lined with good quality rubber and should have a capacity sufficient to accommodate the plating solution of the plating tank. This should also have heating and agitation accessories.

HEATING

The plating tank should be equipped with a suitable heating thermostatically controlled to heat the solution. The following heating equipment is recommended

- Titanium Heating Coil. This can be used where steam or thermic fluid is used for heating purposes.
- Silica cased electric immersion heaters with suitable protective cages can be used for heating is necessary.

FILTER UNITS

It is essential to use continuous filtration during the process. The capacity of the filter unit should be selected as to have minimum two changes of the solution per hour. All the parts of the filter units coming into contact with the solution should be of approved rubber or stainless steel chemical resistant type ANSI 316.

AGITATION

Low pressure, oil free air agitation equipment is recommended to give a vigorous agitation to the solution. The air agitation coil should be made of either Ebonite or Polypropylene. Compressed air coming from an oil compressor, should not be used since oil will get into the solution resulting in faulty deposit such as pitting etc.

ANODES

Cast or rolled depolarised Nickel anodes are recommended. The anode area should be as high as possible. Titanium anode baskets are strongly recommended as these give minimum wastage resulting in high economy due to less rejection as well as less material consumption. Anodes should

be essentially covered with anode bags made of cotton, spun woven Terylene or polypropylene to prevent the anode sludge creeping into the tank and causing roughness to the deposit.



WATER

Hard water should not be used for preparation of solution and for making up of working level of solution as the calcium salts present get crystallised and give roughness and overall dullness to plating deposits.

MAINTENANCE Nickel salt

Where the anode dissolution is proper the nickel salt is generally lost only by drag out and by general wastage. It is strongly recommended that small daily additions of Nickel salt are made and analytical control used to adjust the amounts of the daily additions. Adjust the bath contents as given below:

Nickel Metal	60-80 g/l
Nickel Sulphate	250-350 g/l
Chloride as Nickel Chloride	35-70 g/l
Boric Acid	35-45 g/l

When it is required to make large additions of nickel salt, these additions should be followed by low current density electrolysis to remove metallic impurities.

PURIFICATION Metallic Impurities

Most common metallic impurities found in Nickel solution are copper, zinc, chromium, lead and iron. Zinc, copper and lead and lead can be effectively removed by electrolytic purification accomplished by using corrugated dummy cathode at current density 3 amps/sq. ft. High agitation low pH and high temperature will help to eliminate quickly these impurities. Chromium contamination of hexavalent chrome can be eliminated by adding exact equivalent quantity of lead carbonate so that lead chromate precipitates and is removed by filtration. Care should be taken to avoid excess addition of lead Carbonate, as otherwise this will give dark deposits at low current density region.

Iron can be removed by oxidation carbon treatment as enumerated in the following paragraphs:

ORGANIC IMPURITIES

When the contamination is not severe, the solution by drag in or from pre-treatment solution. These can be removed by oxidation carbon treatment.

OXIDATION CARBON TREATMENT

When the contamination is not severe, the solution can be continuously filtered through a small amount of carbon packed with the filter. Should the solution become seriously contaminated, with organic impurity oxidation, carbon treatment is required to move the same and should be carried out as follows:

Heat the solution to 70C and pump into a storage tank. Add 1-2 grams per litre of potassium permanganate dissolved in water or 2-3 ml of Hydrogen peroxide (100 volumes). Stir well for 30 minutes. Add 3 gms/litre Activated Carbon and equal quantity of filter Aid. Air agitate vigorously for at least 2 hours. Allow the solution to stand without stirring overnight so as to allow the carbon and

other impurities to settle. Filter the solution back into plating tank, taking care not to disturb the layer of sludge at the bottom of the tank. This treatment will remove the Additive **GIT-ZIMAX** and **GIT-702** Brightener and it is therefore recommended to add at the rate of 1-2 ml/l of Additive **GIT-ZIMAX** and 0.1-0.2 ml. **GIT-702** Brightener. Exact addition of Rack Additive **GIT-ZIMAX** should and **GIT-702** should be decided by Hull Cell test.

CONVERSION OF EXISTING SOLUTIONS

Mostly conversion is easily carried out by giving purification treatment and the adjustment of Nickel ion. Chloride and Boric acid contents to the required level by the addition of Rack Bright Nickel salt.

The organic contamination are removed by hydrogen peroxide, carbon or Permanganate carbon and than Additive **GIT-ZIMAX**, **GIT-L900** and **GIT-702** added make up the required concentration level. However, before such a conversion, a sample should be submitted to our laboratory for necessary recommendations.

ANALYTICAL PROCEDURES

Estimation of Nickel

Pipette 1ml of the plating solution into a 500 ml conical flask; dilute it with a small quantity of distilled water. Add about 5ml on ammonium hydroxide solution and a few grains of Murexide indicator. Shake the flask well and titration against 0.1 M E. D. T. A. to purple colour end point. Note the reading; let it be "a" ml of E.D.T.A.

Calculation:

"a" ml of E.D.T.A. x 5.869 = gm/ltr. metal in bath.

Estimation of Nickel Chloride

Pipette 5ml of the solution into 500 ml conical flask and dilute it a small quantity water. Add about 5 ml of Potassium chromate indicator and titrate against 0.1 N silver nitrate until the white precipitate of silver chloride takes on a very faint reddish brown tint. It requires practice to defect the exact end point easily. Note the reading.

Calculation ml of 0.1 N AgNO₃ used X 2.378 = gms/ltr NiCl₂. 6H₂O in the bath.

Estimation of Nickel Sulphate

From the total Nickel metal and Nickel Chloride and concentration, Nickel sulphate can be calculated as follows:

(gm/ltr. of Nickel metal) - (gm litre of Nickel Chloride X 0.247) X 4.79 gm/lit NiSO₄ 7H₂O

Estimation of Boric Acid.

Pipette 1ml of the plating solution into 500 ml conical flask, add 1 Spatula of Mannitol powder. Swirl to make a slurry. Add 2-3 drops of Bromocresol purple and titrate it against 0.1 N NaOH violet to colour end point.

Calculations ml of NaOH x 6.184 = ml/ltr of Boric Acid.