



NIBRITE NICKEL PLUS™ II

- *Maximum leveling.*
- *Mirror bright finish.*
- *Wide operating range.*
- *Process a wide variety of base metals.*
- *Excellent ductility.*
- *Outstanding chrome receptivity.*
- *Cuts plating time.*
- *Deep throw capability.*

MAXIMUM LEVELING BRIGHT NICKEL PROCESS

NICKEL PLUS II is a unique, ultra high performance bright nickel system. It is specifically designed to outperform competitive systems by providing maximum leveling, ultra bright deposits, reliability and economy. Thin or heavy coatings, deposits are bright, highly leveled, super ductile, extremely low stressed while producing a mirror bright surface that readily accepts subsequent coatings of hexavalent or trivalent chrome.

NICKEL PLUS II offers fast, outstanding performance across the entire plating range, particularly in low current density areas and on parts with unusual configurations. It will outperform any competitive process, even in solutions contaminated with metallic impurities. A variety of base metals, including zinc die-castings, can be processed without a loss in performance.

NICKEL PLUS II MAINTENANCE is normally the only material required to replenish all components in an operating bath, or it is available as a multi-component system for those installations preferring this degree of control.

NICKEL PLUS II performs under most operating conditions, such as standard or low concentration salts and/or temperatures and a wide variety of current densities, air or mechanical agitation.

OPERATING DATA

| | <u>Range</u> | <u>Average</u> |
|-------------------------|-----------------------------------------------|---------------------------------------|
| Nickel Metal | 6-12 opg. (45-90 g/l) | 10 opg. (75 g/l) |
| Nickel Sulfate | 15-50 opg. (112-375 g/l) | 32 opg. (240 g/l) |
| Nickel Chloride | 7-20 opg. (52-150 g/l) | 10 opg. (75 g/l) |
| Boric Acid | 6-8 opg. (45-60 g/l) | 7 opg. (52 g/l) |
| NIBRITE CARRIER* | 2-4%/vol. | 3%/vol. |
| NIBRITE LEVELER* | 0.20-0.35%/vol. | 0.3%/vol. |
| NIBRITE MY T WET | 0.1-0.25%/vol. | 0.15%/vol. |
| NICKEL PLUS II | 0.1-0.3%/vol. | 0.15%/vol. |
| pH | 3.8 - 4.3 | 4.0 |
| Temperature | 120-150° F. (48-65° C) | 140° F (60° C) |
| Cathode Current Density | 20-100 asf (2.16-10.80 a/dm ²) | 40 asf (4.32 a/dm ²) |
| Anode Current Density | < 35 asf (3.78 a/dm ²) | < 35 asf (3.78 a/dm ²) |
| Voltage | 3 - 9 volts | 6 volts |

* **These components are used at the time of new bath make-up, conversion of an existing solution or to re-balance a bath after carbon treatment or solution loss.**

The optimum bath composition for a given installation depends upon the the equipment available and the parts to be plated. Factors such as current density, type and finish of base metal, thickness required, part configuration, etc. should also be considered.

If a new plating solution is to be made-up, **A BRITE** can supply helpful information and instructions that will take into account all factors involved and that will insure an easy and trouble-free start-up.

REPLENISHMENT

Under most conditions, **NICKEL PLUS II** is the only material required for routine maintenance. The exact amount needed depends upon the brightness and leveling required, drag-out and temperature. However most installations should add:

1 gallon of NICKEL PLUS II MAINTENANCE per 8,000-12,000 AH.
(1 liter per 2100-3200 amp hours)

BATH COMPONENTS

Additions are best made by an automatic, computerized amp-hour feeder. This is suggested since it reduces brightener usage and insures more uniform plating quality. This equipment is available from **A Brite Company**. If additions are made by hand, the brightener should be diluted with 50% with water and spread uniformly over the surface of the bath. Smaller, more frequent additions are recommended.

NICKEL PLUS II MAINTENANCE

This is the replenishment material which is added to working solutions to maintain the individual addition agent components at their proper operating levels. This balanced blend is normally the only material (other than wetting agent) that is required.

CARRIER

This is the primary addition agent. Unlike conventional carriers, it promotes a greater degree of brightness by itself. It makes deposits ductile, controls stress, promotes throwing power and checks pitting and metallic contamination. Low concentrations cause a reduction in ductility and an increase in internal stress. It also effects throwing power and lack of response to maintenance brightener.

LEVELER

This is added to freshly made-up solutions and/or conversions to the **NICKEL PLUS II PROCESS** which are low in overall **LEVELER** concentration. It provides the necessary leveling component for ultra high quality plating. This component reacts with the other agents in the bath to provide the proper leveling performance. If the other agents in the system are low, the leveler will be slow to respond and the bath will not perform until the brightener imbalance is corrected.

Moderately low concentrations will slightly reduce leveling performance, while a significantly low concentration will noticeably reduce performance and can cause poor brightness as well as poor leveling. Slightly high concentrations will have no effect on performance, however an extreme excess can result in brittleness and hazy deposits that may be difficult to chrome plate. **LEVELER** is a clean, stable material and will not contribute to organic contamination.

MY T WET

This low foaming surfactant is added as required to control hydrogen gas pitting. It can be used in mechanically or air agitated baths. It is not intended as a "purifier" to hide the effects of impurities, nor does it exhibit detergency properties and it will not emulsify oils and greases. Low concentrations result in pitting in higher current density areas. A moderately high concentration has no effect, however an extreme excess can result in a cloudy deposit. **MY T WET** is available in different formulations, depending upon your particular operating conditions.

NICKEL SULFATE/CHLORIDE/BORIC ACID

Nickel Sulfate

This supplies part of the nickel ions to the solution while the chloride supplies the remainder. When utilizing **NICKEL PLUS II** as a low concentration process, higher concentrations of nickel chloride are required. A typical low concentration bath utilizes a Nickel Sulfate concentration of 15-24 opg, Nickel Chloride 14-18 opg and Boric Acid 7 opg. Low nickel sulfate will reduce cathode efficiency, necessitating longer plating times. High level of sulfate allows higher current densities, however it also requires higher concentrations of brightener to achieve proper plating quality.

Nickel Chloride

Nickel chloride improves bath conductivity and anode corrosion. Low concentrations cause anode polarization and an increase in brightener consumption. High concentrations decrease deposit ductility and lead to increased attack on processing equipment.

Boric Acid

Boric acid acts as an overall pH buffer for the solution. It prevents burning and pitting, helps to provide deposit ductility and maintains proper cathode efficiency. Low concentrations cause an increase in bath pH immediately adjacent to the cathode and the formation of metallic hydroxides from metallic impurities present in the solution. These hydroxide compounds are included in the deposit, resulting in brittle and/or burned plate. High concentrations are not detrimental other than to possibly lead to shelf roughness from insoluble boric acid.

BATH pH

NICKEL PLUS II baths plate with a 92-95% cathode efficiency and a 97-99% anode efficiency. Since the cathode efficiency is less than the anode efficiency, some hydrogen ions are reduced at the cathode as hydrogen gas during production. These hydrogen ions are the source of acidity in the bath. Thus, as the acidity is neutralized, the pH of the bath tends to rise. The pH can be lowered with either sulfuric or hydrochloric acid. Always use the purist grade available. High pH results in deposit roughness, (because metallic impurities precipitate as hydroxides above 4.4), brittle deposits and reduced chrome receptivity (due to a tendency for organic films to remain on the surface of the deposit). Low pH reduces leveling and brightness.

Bath pH can be increased by withholding acid additions until pH reaches proper level or nickel carbonate may be added. Additions of carbonate are *very* difficult to dissolve and should be made **only** if absolutely necessary. Additions should be made only through the filter to avoid extremely rough deposits.

Installations using insoluble anodes may require regular additions of carbonate. This is because insoluble anodes reduce the neutralization of hydrogen ions and the pH will tend to drop rather than rise.

The amount of acid required for routine maintenance should be relatively constant. If there is a change of acid (or carbonate) required it's indication that anode polarization is occurring. Check for low anode area or plugged anode bags.

ANODE AND CATHODE CURRENT DENSITY

Cathode Current Density

Cathode current density is the total cathode surface area in the plating tank divided into the total current to the tank. **NICKEL PLUS II PROCESS** allows a very wide current density range without burning while producing an extremely bright and level plate. Too high a current density produces burning, too low results in decreased plating speed.

Anode Current Density

The anode current density is calculated in the same manner as the cathode current density, except than the current to the tank is divided by the total anode surface area. An easy rule of thumb is that the current should not exceed 25 amps for each 12 inches of basket length filled with anode material. This will keep the maximum anode current density below 30 amps per square foot, which is near the upper limit.

Too low an anode current density (too large an anode area for the current drawn) may cause the nickel metal concentration to rise. Too high an anode current density (too low an anode area) can cause anode polarization and if severe can cause the generation of chlorine gas at the anode. This can cause increased use of maintenance brightener, however since **NICKEL PLUS II** does not contain any index materials, brightener consumption is not affected. The generation of chlorine gas also reduces the anode bag life since it embrittles the fabric rapidly. This can lead to split bags which will introduce solids and cause roughness.

EQUIPMENT

Anode Type

Electrolytic squares, chips, or "R" rounds, SD (Sulfur Depolarized) or "S" rounds, cast or rolled carbon, high purity nickel anodes are recommended. Electrolytic squares or "R" rounds are preferred since it produces the least amount of solids on dissolution. Double bagging is recommended due to the increased amount of solids that may be introduced into the bath.

Anode Bags

Napped polypropylene or napped Dynel are recommended. Always leach bags prior to use in hot water containing 0.5%/volume sulfuric acid and 0.1%/volume **MY T WET**. Failure to do so will introduce sizing agents into the nickel bath which are very difficult to remove and can cause micro-pitting, hazy deposits and difficulty in chrome plating. **A BRITE** can supply low cost anode bags specifically designed for maximum plating performance.

Plating Tank

Koroseal lined, polyethylene, polypropylene or lined steel tank are satisfactory. Fiberglass is not recommended.

Heaters

Titanium electric immersion heaters or titanium steam coils are satisfactory. Automatic temperature control should be used. All types of heating devices are available from **A BRITE**.

Agitation

Low pressure air supplied by a blower is recommended. Compressed air **is not satisfactory**, due to the introducing of oil to the nickel solution, no matter how many "filters" are installed on the line. The volume of air should be sufficient to provide uniform movement of the solution throughout the tank. If mechanical agitation is utilized, movement of the cathodes rod should be 3-9 feet per minute. **A BRITE** can supply specific information and diagrams on the proper design and materials required to build a professional air distribution system.

Ventilation

Ventilation equipment is recommended to remove the steam vapors that are produced from the bath. This equipment is available from **A BRITE**.

Filtration

Continuous filtration through **ECOCARB** or a mixture of filter aid and activated carbon is required. The filter should be packed according to the **ECOCARB** literature or in the case of filter aid and carbon, to the filter manufacturers' recommendations. Start with 2 pounds of carbon per 1000 gallons of plating solution. Carbon should be mixed with about twice as much filter aid and packed on the filter. The filter should be changed at least once per week, more frequently if running multiple production shifts or if there is an unusually heavy amount of organic matter to be removed. The filter should be sized to turn the solution over at least twice per hour. Filter and hoses should be constructed of materials that are suitable for use with nickel plating solutions. The discharge hose should be plumbed so that solution is returned to the bottom of the tank and opposite the intake hose. **A BRITE** can assist in the proper sizing as well as supply any filter and filter media requirements.

TREATMENT

All nickel plating solutions periodically require batch carbon treatment to remove the impurities that build-up as a result of normal everyday use and drag-in. Treatments should be done in a separate tank, never in the plating tank itself. Treatment tank should be equipped as the plating tank itself, (i.e. heaters, filter, agitation). A detailed treatment procedure can be obtained from the **A BRITE TECHNICAL SERVICE CENTER**.

NON-FERROUS SUBSTRATES

NICKEL PLUS II is exceptionally tolerant to copper and zinc contamination, thus does not require a "special carrier" or "special brightener". If high levels of copper or zinc contamination are encountered, low current density areas may show dullness and reduced leveling. Adds of 0.05%-0.1% by vol. of **NICKEL MAGIC** will restore proper plating performance.

CONVERSION

NICKEL PLUS II PROCESS is compatible with all organic addition agent systems currently in use. Conversion from a competitive system can be done without the need for batch treatment or loss of production. A sample should be sent to the **A BRITE TECHNICAL SERVICE CENTER** for recommendations that will insure an easy, trouble-free conversion.

STORAGE/HANDLING

NICKEL PLUS II addition agents should be stored in a cool dry area. If material freezes, move to a warm area and thoroughly mix prior to use to insure uniform composition of the material. The agents are not combustible.

The addition agents are near neutral liquids that do not require special handling. However, the solutions in which they are used require the handling of acidic, nickel bearing materials. Do not take internally. Avoid prolonged contact with the skin. Avoid contact with the eyes. Wear proper protective clothing and safety gear. **Refer to the Material Safety Data Sheet for more specific information before using this product.**

WARRANTY

The information presented herein, while not guaranteed, is to the best of our knowledge true and accurate. No warranty or guarantee expressed or implied is made regarding the performance of any products, since the manner of use is beyond our control. No suggestion for product use nor anything contained herein, shall be construed as a recommendation for its use in infringement of any existing patent, and we assume no responsibility or liability for operations which do infringe any such patents. The above includes confidential and proprietary information of **A BRITE COMPANY** and is furnished to you for your use solely on products or processes supplied to you by us.