



NIBRITE™ **PENTASTAR ONE™**

- **The ultimate in brightness and leveling.**
- **Super deep throw, unmatched by competitive processes.**
- **Reduces plating costs.**
- **Excellent ductility.**
- **Outstanding chrome receptivity.**
- **Less maintenance, Less need for batch carbon treatment.**
- **Cuts plating time, reduces rejects.**
- **Super bright, uniform deposits.**

ULTIMATE BRIGHT NICKEL PROCESS

PENTASTAR ONE is a technological breakthrough in ultra high performance bright nickel systems. It is specifically designed with cleaner, stable organic compounds that enable it to provide ultra bright deposits with maximum leveling, uncommon ease of control and less need for batch carbon treatment.

PENTASTAR ONE outperforms other nickel processes by producing white-bright, highly leveled, super ductile, and extremely low stressed deposits, while producing a finish that readily accepts subsequent coatings of hexavalent or trivalent chrome.

PENTASTAR ONE offers fast, outstanding, uniform performance across the entire plating range, *especially in extremely low current density areas*, making it ideal to use on deep throw applications and on parts with unusual configurations.

PENTASTAR ONE performance is outstanding in most any plating application, even in solutions contaminated with zinc and copper impurities. It does not require special purifiers or correcting solutions, and is designed to reduce the effects of iron contamination, reducing the need for iron complexors.

PENTASTAR ONE produces a high quality deposit even with short plating times. This can reduce nickel thickness, thus reduce nickel consumption, increase production and substantially lower plating costs.

PENTASTAR ONE is a premium performance addition agent that 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.

PENTASTAR ONE provides excellent performance under most operating conditions, such as standard or low concentration salts and/or temperatures and a wide variety of current densities, or 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)
<i>NIBRITE CARRIER *</i>	2-4%/vol.	3%/vol.
<i>NIBRITE ENHANCER*</i>	0.20-0.35%/vol.	0.3%/vol.
<i>NIBRITE MY T WET</i>	0.1-0.25%/vol.	0.15%/vol.
<i>PENTASTAR ONE</i>	0.1-0.3%/vol.	0.15%/vol.
pH	3.5-4.3	4.0
Temperature	110-150 F. (43-66° C)	140 F. (60° C)
Cathode Current Density	20-100 asf (2.16-10.8 a/dm ²)	40 asf (4.3 a/dm ²)
Anode Current Density	< 35 asf (<4 a/dm ²)	< 35 asf (<4 a/dm ²)
Voltage	3-9 volts	6 volts

* Normally these components are used at the time of new bath make-up, conversion or to rebalance bath after carbon treatment or solution loss.

Bath operating conditions for your installation depends upon the requirements unique to the equipment available and the parts to be plated. Important considerations are: current density, type and finish of base metal, thickness required, and part configuration. **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

PENTASTAR ONE

This is the brightener/replenisher material used to maintain addition agent components at their proper operating levels. This balanced blend is normally the only material (other than wetting agent) that is required. High concentrations (brightener overloads) can be overcome quickly and easily without loss of production or cracked, brittle deposits.

Under most conditions, **PENTASTAR ONE MAINTENANCE** is the only material required for routine maintenance. The amount needed depends upon the brightness and leveling required, drag-out and temperature. Most installations should add:

1 gallon of PENTASTAR ONE per 10,000-14,000 AH.
(1 liter per 2600-3700 AH)

Additions are best made by an automatic, computerized feeder. It reduces brightener usage and insures uniform plating quality.

NIBRITE CARRIER

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

NIBRITE ENHANCER

This is added to freshly made-up solutions and/or conversions to **PENTASTAR ONE** which are low in overall **ENHANCER** concentration. This component reacts with other materials in the bath to provide proper plating performance. If the other agents in the system are low, the **ENHANCER** will be slow to respond and the bath will not perform until the brightener imbalance is corrected. **ENHANCER** is a clean, stable material and will not contribute to organic contamination.

Moderately low concentrations will slightly reduce bath performance, while a significantly low concentration causes poor brightness and leveling. Slightly high concentrations have no effect, however an extreme excess can cause brittleness and hazy deposits.

NIBRITE ADJUSTER PE

This is a highly concentrated specialized addition agent. It is the pure "kicker" portion of the system and utilized when additional overall brightness is required. Unlike other adjusters, it also has unique properties that enhance low current density performance. Use only after prolonged shutdown, bath imbalance, unusual part configurations or when recommended by the **A BRITE TECHNICAL SERVICE CENTER**. High concentrations can cause black deposits in the low current density areas. Typical additions are 0.025-0.1% by volume. **Note: PENTASTAR ONE** contains **NIBRITE ADJUSTER PE**. Under normal operating conditions, **PENTASTAR ONE** will maintain proper **ADJUSTER PE** balance and offer unparalleled performance. Therefore, it is strongly advised that it be used only upon the recommendation of your **A BRITE TECHNICAL SERVICE REPRESENTATIVE** or **THE TECHNICAL SERVICE CENTER**.

NIBRITE MY T WET

This is a low foaming surfactant that is added as required to control hydrogen gas pitting. It can be used in mechanically or air agitated baths. It is not intended to be used 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 under shelf areas. A 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 operating conditions.

NICKEL SULFATE/CHLORIDE/BORIC ACID

Nickel Sulfate/Chloride

This is a source of nickel ions to the bath. When utilizing **PENTASTAR ONE** as a low sulfate 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, causing longer plating times. High levels of sulfate allows higher current densities, however, it also requires higher concentrations of brighteners to achieve plating quality as well as more to waste treat. For overall economy, speed and trouble-free production, a standard watts bath is recommended.

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

Boric Acid

Boric acid acts as a pH buffer for the bath. It prevents burning and pitting, provides deposit ductility and maintains cathode efficiency. Low concentrations cause an increase in bath pH immediately adjacent to the cathode and the formation of metallic hydroxides from any metallic impurities present in the solution. These hydroxide compounds are included in the deposit, resulting in brittle and/or burned plate. High concentrations lead to shelf roughness from insoluble boric acid.

BATH pH

Baths using **PENTASTAR ONE** 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 (the source of acidity in the bath) are neutralized during production. As the acidity is neutralized, the pH of the bath will rise. The pH can be lowered with either sulfuric or hydrochloric acid. Always use the purist grade available.

High pH results in deposit roughness, (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 can reduce leveling and brightness.

Bath pH can be increased by either 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 rough deposits. The amount of acid (or carbonate) required for maintenance should be relatively constant. If there is a change of acid required, it's an indication that anode polarization is occurring. Check for low anode area or plugged anode bags.

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.

ANODE/CATHODE CURRENT DENSITY

Cathode Current Density

Cathode current density is the total cathode surface area in the plating tank divided by the total current to the tank. The **PENTASTAR ONE** allows a wide operating current density range without burning as well as produce an extremely bright and level plate. Too high a current density produces burning, while too low results in decreased plating speed.

Anode Current Density

Calculate the anode current density in the same manner as the cathode current density, except the current to the tank is divided by the total anode surface area. Current should not exceed 25 amps for each 12 inches of basket length filled with nickel anode material, keeping the maximum anode current density below 30 amps per square foot.

Too low 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. Since **PENTASTAR ONE** does not contain index materials, brightener consumption is normally not affected. Chlorine gas embrittles fabric rapidly, reducing anode bag life.

EQUIPMENT

Anode Type

Electrolytic squares, "R" rounds, SD (Sulfur Depolarized) or "S" rounds, high purity nickel anodes are recommended. Electrolytic squares or "R" rounds are preferred as its produces lower amounts of solids on dissolution. All **NiBrite** baths operate well with the above mentioned nickel forms.

Anode Bags

Napped polypropylene 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 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 steam coils with automatic temperature control should be used. All types of heating devices are available from **A BRITE**.

Agitation

Low pressure air supplied by a blower only. Compressed air is not satisfactory, due to the introduction of oil to the nickel solution, no matter how many "filters" are installed on 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 on the proper design and materials required to build a professional air distribution system.

Ventilation

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. A good starting place is 2 pounds of carbon per 1000 gallons of plating solution. Carbon should be mixed with approximately 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 shifts or if there is a heavy amount of organic contamination. 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

Due to its super clean organic formulation, **PENTASTAR ONE** rarely requires batch carbon treatment. However all nickel plating solutions periodically requires such a 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.

NON-FERROUS SUBSTRATES

Copper and zinc contamination is normally not a consideration because the unique formulation of **PENTASTAR ONE** does not allow the build up of this type of contamination. Thus **PENTASTAR ONE** does not require a "special carrier", "special brightener" or "purifiers". However, under very special circumstances if unusually high levels of copper or zinc contamination are encountered, **NIBRITE CORRECTOR** is available to restore proper plating performance.

CONVERSION

PENTASTAR ONE is compatible with all bright nickel processes 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 a trouble-free conversion.

STORAGE/HANDLING

PENTASTAR ONE components 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.