

E-Brite 2.0 Ag (Interim)

Second Generation Non-Cyanide Alkaline Silver-Plating Process

E-Brite 2.0 Ag is a new EPI break-through electroplating technology, which can plate non cyanide silver directly on nickel surfaces (meeting all three types of **ASTM B-700** and spec **AMS 2411J**), as well as plate directly on silver, brass, bronze and copper and does not require a separate silver strike on these substrates.

E-Brite 2.0 Ag is an alkaline, cyanide free plating solution, which can plate bright silver for electronic, industrial and decorative uses. **E-Brite 2.0 Ag** eliminates the high cost of waste treatment of cyanide. It operates at room temperature and can be utilized in both rack and barrel plating. **E-Brite 2.0 Ag** provides an extremely stable alkaline non-cyanide silver plating chemistry.

E-Brite 2.0 Ag has exceptional covering and throwing power. It produces a fine-grained, smooth, dense, silver deposit with low porosity and excellent bonding properties.

E-Brite 2.0 Ag plating exhibits a superior, brilliant white color and its deposit shows a better anti-tarnishing property than other non-cyanide silver processes. It is cost effective because it plates entirely out of the silver anodes rather than the solution. Maintaining **E-Brite 2.0 Ag** is easy with a maintenance electrolyte additive **E-Brite 2.0 Ag-E** and a brightener and grain refiner **E-Brite 2.0 Ag-B**.

E-Brite 2.0 Ag is supplied as a liquid concentrate, which contains 5 oz/gallon (37.5 g/l) of silver. The concentrate is diluted with D.I. water per the bath make-up information below.

Plating Specifications:

	Rack Plating		Barrel Plating	
	<u>Optimum</u>	<u>Range</u>	<u>Optimum</u>	<u>Range</u>
Silver Metal	1.5 oz/gal (11g/l)	1.25-2.25oz/gal (9.5-17g/l)	1.5 oz/gal (11g/l)	1.25-2.25 oz/gal (9.5-17g/l)
pH	10.0	9.5-10.5	10.0	9.5-10.5
Temperature	68°F (20°C)	60-75°F (16-24°C)	68°F (20°C)	60-75°F (16-24°C)
Cathode current density	3-10 ASF (0.3-1.0 A/dm ²)	2-20 ASF (0.2-2 A/dm ²)	1-3ASF (0.1-0.3 A/dm ²)	0.5-5 ASF (0.05-0.5 A/dm ²)
Anode current density	--	2-10 ASF (0.2-1.0 A/dm ²)	--	2-10 ASF (0.2-1.0 A/dm ²)
Agitation	air agitation on the cathodes.			

Charging a New Bath (plate over Nickel)

	Rack Plating		Barrel Plating	
	<u>Optimum</u>	<u>Range</u>	<u>Optimum</u>	<u>Range</u>
E-Brite 2.0 Ag concentrate	30%	25-35%	30%	25-35%
E-Brite 2.0 Ag-E electrolyte	30%	25-35%	40%	35-45%
E-Brite 2.0 Ag-B brightener	1%	0.8-1.5%	1%	0.8-1.5%
D.I. Water	39%	49-30%	29%	39-19%

Example of New 100 Gallon/100 Liter Bath Make-up (plate over Nickel)

	Rack Plating	Barrel Plating
E-Brite 2.0 Ag concentrate	30 Gallons/30 Liters	30 Gallons/30 Liters
E-Brite 2.0 Ag-E electrolyte	30 Gallons/30 Liters	40 Gallons/40 Liters
E-Brite 2.0 Ag-B brightener	1 Gallon/1 Liter	1 Gallon/1 Liter
D.I. Water	39 Gallons/39 Liters	29 Gallon /29 Liters

Charging a New Bath (plate over metal substrates other than Nickel)

	Rack Plating		Barrel Plating	
	<u>Optimum</u>	<u>Range</u>	<u>Optimum</u>	<u>Range</u>
E-Brite 2.0 Ag concentrate	40%	35-45%	30%	25-35%
E-Brite 2.0 Ag-E electrolyte	25%	20-30%	40%	35-45%
E-Brite 2.0 Ag-B brightener	1%	0.8-1.5%	1%	0.8-1.5%
D.I. Water	34%	44-24%	29%	39-19%

Example of New 100 Liter Bath Make-up (plate over substrates other than Nickel)

	Rack Plating	Barrel Plating
E-Brite 2.0 Ag concentrate	40 Liters	30 Liters
E-Brite 2.0 Ag-E electrolyte	25 Liters	40 Liters
E-Brite 2.0 Ag-B brightener	1 Liter	1 Liter
D.I. Water	34 Liters	29 Liters

Equipment and Operation:

Agitation	A high volume, low pressure air source is required for air agitation of cathodes.
Anode	Pure silver anodes should be used.
Anode/cathode ratio	A 2:1 anode to cathode ratio is required. Calculate the maximum cathode area before setting up the process and ensure the anode area is two times the maximum cathode area.

Filtration	The solution must be kept free of suspended matter in order to prevent roughness. Continuous filtration with 1micron filter is recommended. New filter cartridge must be flushed prior to use by circulating DI water through the cartridge.
Tank	Plastic tanks may be used. Large polypropylene tanks must be reinforced.

Warning: Tanks, racks, filters, barrels and other equipment must be thoroughly cleaned before using them with an **E-Brite 2.0 Ag** solution. Equipment previously used for cyanide silver should be washed with hypochlorite solution and the tank soaked for 24 hours in 2% hypochlorite to destroy residual cyanide. After removal of the hypochlorite solution and water rinsing, a 5% sulfuric acid or nitric acid rinse should be used, followed with another rinse with DI water. When destroying cyanide, forced ventilation should be used at all times to prevent toxic cyanide fumes from accumulating. Personnel should be equipped with self-contained breathing apparatus.

Best results are obtained with a new tank or by installing a new flexible liner in a tank which previously contained a cyanide silver solution and which has been cleaned as outlined above. New anodes and baskets are also recommended.

Plating additives

E-Brite 2.0 Ag liquid concentrate and silver metal replenisher.

E-Brite 2.0 Ag-E liquid concentrate of electrolyte replenisher. Periodic adds over time based on ampere hours, on Hull Cell tests or analysis by **EPI**.

E-Brite 2.0 Ag-B liquid concentrate of brightener and grain refiner. Periodic adds over time based on ampere hours, on Hull Cell tests or analysis by **EPI**.

pH control for E-Brite 2.0 Ag solution

It is very important to operate **E-Brite 2.0 Ag** at pH range 9.5 to 10.5. If pH is below 9.5, adjust with KOH. If pH is over 10.5 adjust with 50% nitric acid. **The pH must not go over 11.5**

Replenishment of Plating Solution

E-Brite 2.0 Ag concentrate

has a silver concentration of 5.0 oz/gal (37.5 g/l). The working bath has a silver concentration of 1.25 to 2.25 oz/gal (9.5 -17g/l). If the silver concentration in the bath decreases, addition of **E-Brite 2.0 Ag** concentrate is required to replenish silver and the other balanced components in the

working solution. The strength of the working solution is monitored by determining the silver concentration.

E-Brite 2.0 Ag-E electrolyte

added initially at 25-30% by volume and on a regular basis (daily) to complex the silver dissolved from the anodes and to replace drag-out. Its consumption will depend upon drag-out, silver metal content and metallic contamination in the bath. The proper concentration of **E-Brite 2.0 Ag-E** must be maintained for maximum adhesion to the base metal, especially when plating over Nickel. Periodic adds are required over time based on ampere hours, Hull Cell test or EPI's lab recommendations. A metering pump controlled by amp-hours is recommended for adding **E-Brite 2.0 Ag-E**. If the silver metal concentration of the bath increases, 2% by volume **E-Brite 2.0 Ag-E** must be added to the bath for each 0.1 oz/gal (0.75 g/l) increase in silver concentration. A loss of adhesion will occur if sufficient **E-Brite 2.0 Ag-E** is not maintained. Add **E-Brite 2.0 Ag-E** based on the amp-hour electrolyte usage as follows: add approximately 1.5 liters of **E-Brite 2.0 Ag-E** for every 1000 amp hours (1 gallon per 2400 -2600 amp hours) of electroplating.

E-Brite 2.0 Ag-E Booster

Used only after carbon filtration or dummy plating treatment to get rid of organic contamination to the plating bath; Normally following the above treatment, based on hull cell analysis, add 2% **E-Brite 2.0 Ag-E Booster** and 3% **E-Brite 2.0 Ag-E** to replenish the electrolyte lost during the above treatment.

E-Brite 2.0 Ag-B brightener and grain-refiner

Add **E-Brite 2.0 Ag-B** based on the amp-hour electrolyte usage as follows: add approximately 1.0 liter of **E-Brite 2.0 Ag-B** for every 1000 amp hours of electroplating.

E-Brite 2.0 Ag bath control

The bath is maintained by measuring the pH, by titrating the silver concentration, and by running Hull Cell panels to determine contamination and evaluate plate adhesion.

Silver Analysis

1. Pipette a 10 ml sample of the plating solution into a 250 ml Erlenmeyer flask. Add 50 ml distilled water.
2. Add 2 ml concentrated nitric acid and 2 ml of 98% H₂SO₄ . Heat up solution and boil for 5 min.
3. Wait until the solution cools down and add 5 ml of 2% ferric ammonium sulfate solution.
4. Titrate with standard 0.1 N potassium thiocyanate (KSCN) solution until the light orange color remains.
5. oz/gal silver metal = (ml of KSCN) x 0.144

Cleaning Parts

It is extremely important to evaluate the cleaning in the existing line in order to have good performance for the **E-Brite 2.0 Ag** process. EPI has electro-cleaners as well as acid salts that are compatible with the **E-Brite 2.0 Ag** solution.

Plating copper, brass and bronze substrates

1. Soak clean with **EPI's E-Kleen 153** or **E-Kleen 196**.
2. Electroclean with **EPI's E-Kleen 153**
3. Cold water rinse
4. Activation with **EPI's E-Pik 219**.
5. Cold water rinse
6. Cold water rinse
7. Plate with **E-Brite 2.0 Ag**
8. Silver drag out (D.I. Water)
9. Cold water rinse (tap water)
10. Cold water rinse (D.I. Water)
11. A 5% Sulfuric Acid rinse
12. D.I. water rinse
13. **EPI's E-Tec 529** anti-tarnish solution** or **EPI's B.P.A.** electrolytic chromate solution
14. Hot D.I. water rinse
15. Dry

Plating Steel Substrates

1. Soak clean with **EPI's E-Kleen SR 102E**
2. Electroclean with **EPI's E-Kleen SR 1020**
3. Cold water rinse
4. Activation in 50% HCl or 5-20% Sulfuric Acid
5. Cold water rinse
6. Cold water rinse
7. Copper strike with **EPI's E-Brite Ultra Cu** non-cyanide alkaline copper
8. Cold water rinse
9. Cold water rinse
10. Plate with **E-Brite 2.0 Ag**
11. Silver drag out (D.I. Water)
12. Cold water rinse (tap water)
13. Cold water rinse (D.I. Water)
14. A 5% Sulfuric acid dip
15. D.I. water rinse
16. **EPI's E-Tec 529** anti-tarnish solution** or **EPI's B.P.A.** electrolytic chromate solution
17. Hot D.I. water rinse
18. Dry

Plating Fresh Nickel: Electroless and Electroplated Nickel Substrates

1. Cold water rinse
2. Plate with **E-Brite 2.0 Ag**
3. Silver drag-out (D.I. Water)
4. Cold water rinse (tap water)
5. Cold water rinse (D.I. water)
6. A 5% Sulfuric Acid dip.
7. D.I. water rinse
8. **EPI's E-Tec 529** anti-tarnish solution** or **EPI's B.P.A.** electrolytic chromate solution
9. Hot D.I. water rinse
10. Dry

****For tarnish protection on plated silver, be sure to use the heated E-Tec 529 solution at 25% by volume.**

Further protection from tarnishing of silver parts can be accomplished by wrapping them in Silver Saver Volatile Corrosion Inhibitor (VCI) paper available from Daubert Cromwell:

phone 800-535-3535 or website www.daubertcromwell.com

Note: E-Brite 2.0 Ag contains silver in solution and therefore Section 313 of the Federal Emergency Planning and Community Right-To-Know Act, which pertains to reporting, must be adhered to.

Caution

Do not work with the E-Brite 2.0 Ag, E-Brite 2.0 Ag-E and E-Brite 2.0 Ag-B without first reading and understanding the SAFETY DATA SHEETS furnished by EPi. There is the possibility of chronic health effects with **E-Brite 2.0 Ag**. The absorption of silver compounds into the circulation and the deposition of reduced silver in various tissues of the body may result in the production of generalized grayish pigmentation of the skin and mucous membranes (argyria). Generalized argyria develops after 2 to 25 years of exposure. Ingestion is harmful and may cause death.

Packaging

One (1) gallon, five (5) gallon pails and 55 gallon drums

IMPORTANT NOTICE! For Industrial Use Only

The following is made in lieu of all warranties, expressed or implied, including the implied warranties of merchantability and fitness for purpose: seller's and manufacturer's only obligation shall be to replace such quantity of the product as proved to be defective. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. **Neither seller nor manufacturer shall be liable either in tort or in contract for any loss or damage, direct, incidental or consequential, arising out of the use or the inability to use the product.**

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