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TECHNICAL DATA

E-Brite™ 30/30 Manual & Troubleshooting Guide

Non-Cyanide Alkaline Copper Plating

SURFACE PREPARATION

1. Steel, copper, and brass surfaces should be thoroughly cleaned with a hot alkaline cleaning solution followed by a water rinse and then activation in either a dilute hydrochloric or sulfuric acid solution. If adhesion problems arise with difficult-to-plate steel surfaces, a warm, 100 to 120°F solution of **E-Pik 211** or a 140°F, 25% sulfuric acid activation solution is required.
2. Stainless steel surfaces require woods nickel activation or with cathodic (direct) dc current in either a 25% sulfuric acid solution or an **E-Pik 211** or **E-Pik 215** acid salt solution.
3. Freshly plated electroless nickel and sulfamate nickel surfaces require a dip in a sulfuric acid solution at a pH of 3.0. Do not allow surfaces to age prior to plating with **E-Brite 30/30**.
4. Aluminum surfaces must be properly zincated with **EPi's E-Prep 280 NCZ**, non-cyanide zincate. **E-Prep 280 NCZ** was specifically formulated to be compatible with **E-Brite 30/30** and is the only recommended zincate to be used prior to **E-Brite 30/30**. Please see the **E-Prep 280 NCZ** technical data sheet for operating procedures.

BATH COMPONENTS

E-Brite 30/30 liquid concentrate is used to make up a new bath and as a copper replenisher if the copper metal concentration falls during operation. It contains a blend of all the components of the bath. It is normally used at 30 to 50% by volume when making up a new bath. **E-Brite 30/30** contains 2.4 oz/gal copper. Tap water can be used to make up the bath, however, deionized or soft water is preferred.

E-Brite 30/31 is a liquid concentrate of the electrolyte replenisher. It is added to a new bath at 10% by volume on initial bath charge. Periodic adds are required over time based on ampere hours, Hull Cell test or **EPi's** lab recommended additions. It must be added to complex the copper dissolved from the anodes. A properly balanced bath will have a deep blue color. If a green cast develops, it means the bath is low in **E-Brite 30/31** and **E-Brite 30/31** should be added to bring back the deep blue color. A metering pump controlled by amp-hour is recommended for adding **E-Brite 30/31**. It should be added daily. If the copper metal concentration of the bath increases, 4% by volume **E-Brite 30/31** must be added to the bath for each 0.1 oz/gallon increase in copper concentration. A loss of adhesion will occur if sufficient **E-Brite 30/31** is not added.

E-Brite 30/32 is a high current density booster used most often in rack installations. It must be used at 2-4% by volume in rack baths when plating copper as a mask for heat treat stop off. It is added to the bath based on Hull Cell tests or as determined by **EPi's** lab. It will slow down the plating rate, but the grain size will be greatly reduced as will the burn in the HCD.

E-Brite 30/32 is not used in barrel baths. If it freezes, thaw and mix thoroughly before using.

E-Brite 30/35 is a pH adjuster and buffer used when charging a new bath to adjust the pH to the range of 9 to 10. Additions are determined by pH measurement with a pH meter. It is normally used at 5 to 10% when charging a new bath, depending upon how much **E-Brite 30/30** and **E-Brite 30/31** were used in making up the bath. A new bath will have a pH of 8.2 upon make up and before adding the **E-Brite 30/35**. It is added to a bath to maintain the pH if acid is dragged into the bath.

BATH COMPOSITION

E-Brite 30/30	40% by volume
E-Brite 30/31	10% by volume
E-Brite 30/35	8% by volume or until pH reaches 9.4 to 9.8
E-Brite 30/32	2-4% by volume when bath used as a heat treat stop off plate. Occasionally used in other baths. It is not required in strike baths.
Water	Remainder of volume

PLATING SPECIFICATIONS

	Rack Plating		**Barrel Plating**	
	Optimum	Range	Optimum	Range
Copper Metal	1.2 oz/gal	1.0 -1.5 oz/gal	1.0 oz/gal	0.8 to 1.2 oz/gal
pH	9.6	9.2 – 10.0	9.8	9.5 - 10.0
Temperature	120°F	100 - 140°F	120°F	100 to 140°F
Voltage	- -	1 - 6 volts	- -	15 to 18 volts
Cathode-Current Density	15 ASF	5 to 30 ASF	5 to 8 ASF	2 to 10 ASF

Anode-Current Density Minimum of 10 ASF in order to corrode the anodes and maintain the copper concentration in the bath.

Agitation Vigorous air mandatory for rack lines and also helpful in barrel lines. Use low pressure, large volume blowers only - not compressed air. In-tank filter systems do not produce sufficient solution agitation to be used with **E-Brite 30/30** and must not be used for agitation or for filtration. Air agitation aids in producing a brighter finish and helps to avoid burning in the high current density areas.

Plate Thickness Minimum of 0.0002 inches for a strike

Anode Baskets Titanium only

Copper Anodes Oxygen-free UNS C10100 or C10200 only. Use bar or balls. Oxygen-free UNS C10100 or C10200 copper anodes from Univertical, IMC-Metals America, or Outokumpu are acceptable. Do not use phosphorous-containing anodes.

Anode/Cathode Ratio Approximately 1.5 to 1 upon the initial charge of a tank. Thereafter, anodes should be added or removed to maintain an anode current density of at least 10

ASF to dissolve sufficient copper to maintain a consistent copper concentration in the bath. If the anodes become polarized, as evidenced by an orange/brown film on the anodes, the anode area must be reduced by removing anodes to increase the current density. In some installations it may prove to be helpful to use bar anodes or 1 1/2 - 2 inch diameter ball anodes instead of copper nugget anodes in order to develop sufficient anode current density. If copper metal concentration increases in barrel applications, copper anodes should be added to reduce the current density and slow down the dissolving of the anodes. If metal decreases in barrel application, then anodes are removed to increase the current density. In rack applications, if copper metal concentration increases, pull copper anodes and replace with inert anodes. If copper metal decreases, remove inert anodes and add copper anodes.

Inert Anodes, Graphite Anodes, or Stainless Steel Anodes

With some installations it may prove to be helpful to use a mix of copper and graphite or stainless steel (304 or 316) anodes in order to plate down too high of a copper concentration. In most rack installations a mixture of graphite or Stainless steel and copper anodes is advantageous. Use only high density, pure graphite extruded or molded anodes – grade JC-1.

Filtration

Continuous 5 micron, 2-3 turns per hour. A one (1) micron filter required for heat-treat stop off baths. New filter cartridges must be leached with hot water to avoid contamination in the bath with organics which will cause a discolored, dull plate.

Carbon Filtration

A sulfur-free carbon pack must be maintained on the bath--one pound of activated powdered carbon per 100 gallons of bath. Change the pack at least once a week.

pH Control

An electronic pH meter must be used. If pH falls, add **E-Brite 30/35.** If pH goes over 10.4 or above a recommended level, add **E-Brite 30/37**.

Racking

Positive, firm racking with good contact is recommended. Wiring parts can lead to difficulties as can hanging parts on hooks.

Heating

Teflon coated electric heaters are recommended. Scorching the solution must be avoided. D rated heaters should be used. Stainless steel or titanium heaters may be used. Also 316 stainless steel, titanium or Teflon steam coils.

Ventilation

Not required, but is good practice with heated solutions.

Tanks:

Mild steel lined with rubber, Koroseal or polypropylene or a drop in liner. All plastic tanks may be used. Large polypropylene tanks must be reinforced. New plastic tanks and liners must be leached with a 2% Potassium or Sodium Hydroxide solution for 2 days followed by a cold water rinse.

NOTE

When **E-Brite 30/30** is used to replace cyanide copper in a plating line, it has been found that it is very difficult to completely destroy residual cyanide and that is why a new drop-in plastic tank liner is recommended or a new tank be used. Anodes previously used with cyanide must be replaced. Anode bars, anode baskets, bus bars, racks and barrels must be free of residual cyanide. The equipment must be washed with sodium hypochlorite or hydrogen peroxide solutions. Do not neglect heating and filtration equipment. Rinse thoroughly with cold water and then rinse with dilute 1 to 2% sulfuric acid solutions. When destroying cyanide, forced ventilation must be used at all times to prevent toxic cyanide fumes from accumulating. Personnel should be equipped with self contained breathing apparatus.

New racks and barrels are recommended.

Cleaning Parts

Unlike cyanide baths, the mild **E-Brite 30/30** solution does not offer any cleaning.

Therefore, it is extremely important to evaluate the cleaning in existing lines. Consult with **EPI** for the appropriate compatible **E-Kleen** brand of cleaner. Cleaners must be free rinsing to avoid contaminating subsequent steps in the process with organic surfactants and wetting agents.

RINSING

Whenever possible, 2 or 3 stage counter-current flow rinses are recommended immediately prior to the **E-Brite 30/30** bath. It is especially helpful following acid dips to reduce the amount of dissolved iron being dragged into the **E-Brite 30/30** bath.

A soft water rinse prior to the **E-Brite 30/30** bath will improve performance.

CONTAMINANTS

Cyanide, lead, organics and high levels of dissolved iron are all contaminants to an **E-Brite 30/30** bath.

Cyanide contamination causes a chalky or matte light brown to blackish plate in MCD area of a Hull Cell. Cyanide can be removed by hydrogen peroxide treatment (1 pint of 35% peroxide per 100 gallons of bath) or by high current dummy plating. Dilute the peroxide with 50% water before slowly adding to the bath with strong air agitation.

Lead contamination, over 30 ppm, also causes a dark brown to black powdery deposit in the MCD and HCD area of a Hull Cell panel and can be removed only by high current density dummy plating onto corrugated steel plates covered with leached anode bags. As the contaminated solution plates on the cathode it will slough off the steel and be collected in the bags. The sloughed off material must be washed from the bags every hour or so to avoid re-dissolving. Rinse bags and steel cathode to remove the powdered material into the bags, not back into the bath.

Organic contamination from drag-in of wetting agents causes a discolored dull, chalky, dark brick red deposit which is removed by peroxide and batch carbon treatment. Do not use organically inhibited acid prior to an **E-Brite 30/30** bath. The inhibitor will be carried into the bath causing a loss of adhesion in the LCD area.

Iron contamination becomes a major problem when the iron concentration is over 2,000 ppm. Iron contamination causes loss of adhesion in the high current density areas. The effect of iron can be overcome by adding **E-Brite 30/31**. However, iron is plated out continuously in the HCD area. Excessive iron can be removed by high current dummy plating onto steel strip cathodes covered with leached anode bags to collect the plated out iron which will slough-off into the anode bags and can be discarded. Use procedure outlined above for lead contamination.

ADHESION EVALUATION

Check adhesion by running a Hull Cell panel at 1 amp for 5 minutes for rack and 1/2 amp for 5 minutes for barrel. Apply masking tape lengthwise, along the middle of the panel, and bend the panel back on itself through the middle of the masking tape. Then, bend back to flatten the panel. The tape is snapped off the LCD end. There should not be any loss of adhesion -- not even in the low current density area. If there is a loss of adhesion, add **E-Brite 30/31** to the Hull Cell in one (1) percent increments until loss of adhesion is eliminated. Then, add the same percentage to the bath. Or, plate a 1 amp, 5 minute Hull Cell panel, rinse with water and plate bright nickel over it at 2 amps for 10 minutes. Then bend the panel at the bottom corner of the LCD area. There should be no loss of adhesion in the LCD--first 1" of the panel. The same can be done with tin plating. If

there is a loss of adhesion, add **E-Brite 30/31** in 1% increments as above. It may require as much as 5% **E-Brite 30/31**. Loss of adhesion will develop on a Hull Cell panel prior to occurring in a production bath enabling the Hull Cell panel test to predict loss of adhesion.

If organic contamination is the cause for the loss of adhesion, it must be removed by peroxide/carbon treatment.

Trouble Shooting

PROBLEMS	POSSIBLE CAUSES	REMEDIES
Discolored plating, chalky, brick red to black and sometimes peels off.	Organic contamination dragged in from cleaners or due to poor cleaning.	Change carbon filters or peroxide/carbon batch treatment. Improve cleaning and rinsing.
	Cyanide contamination - from previous copper cyanide process or other cyanide plating processes in the vicinity.	Temporary treatment with peroxide. LCD dummying. Trace and eliminate the sources of cyanide - such as cracked racks.
Non-adherent plating, particularly in LCD areas or upon bending.	Low **E-Brite 30/31**	Add **E-Brite 30/31** 1 to 2% by volume at a time - check Hull Cell plating results, then add to bath.
	Poor cleaning and surface preparation.	Ensure proper soak, electroclean and acid along with good, counter-flow rinsing.
Copper plating adhesion okay but copper and nickel plated parts, upon bend testing fail - problems more particular to barrel plating	Low **E-Brite 30/31**	Add **E-Brite 30/31**, 1 to 2% volume at a time and check Hull Cell plating results. Carry out adhesion tests.
	Low pH	Add **E-Brite 30/35** to raise pH to 9.8
	Copper metal too high	Lower the copper metal by plating out of bath using graphite or stainless steel anodes or a combination of copper and graphite and/or stainless steel anodes.
Dark, spongy deposits in HCD areas accompanied by poor adhesion in LCD areas.	Iron contamination	Ensure good double counterflow rinsing after acid pickling and before plating to minimize acid and iron contamination of plating bath. HCD dummy plate to remove iron. Remove fallen parts – fish out plating bath tank bottom with a magnet.

PROBLEMS	POSSIBLE CAUSES	REMEDIES
Black non-adherent plating in HCD areas.	Lead contamination from leaded brass or leaded steel parts being plated Note: **E-Brite 30/30** should not be used to barrel plate over pure lead. Example: bullets	HCD dummy plate to remove lead on a periodic basis.
Burned deposits in HCD areas	Too much current	Lower Current
	No, or insufficient air agitation.	Ensure good vigorous air agitation.
	Too low temperature	Raise temperature to 120 to 140°F.
	Too low copper metal (below 0.5 oz/gal.)	Raise copper metal to at least 0.8 oz/gal. (preferably 1.0 oz/gal.) by adding **E-Brite 30/30**.
	Low **E-Brite 30/32** concentration if being used in a particular bath.	Add **E-Brite 30/32**.

WASTE TREATMENT

Copper from **E-Brite 30/30** rinse water, by itself or when mixed with other metallic rinse waters, is precipitated by conventional sodium hydroxide treatment. Sometimes the addition of lime (CaO) can prove to be helpful in precipitating the copper. **EPi's Coagulants** and **Polymers** are available.

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