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TECHNICAL DATA

E-Brite™ C-135

Cadmium Plating

The **E-Brite C-135** is a single additive brightener for cyanide cadmium plating with tremendous throwing power that produces a smooth, ductile deposit with an exceptional white brilliance that approaches silver plating in appearance. A desirable blue-bright, highly reflective finish can be obtained with a clear chromate dip. The single additive formulation assures a well balanced, highly stable system that requires little adjustment in either barrel or rack baths! It works well with high or low cadmium levels.

The **E-Brite C-135** deposit remains bright in low current density areas so excessive bright dipping is not needed. With ordinary cadmium plating low current conditions produce a very dark, dull finish which must be corrected by excessive bright dipping in a chromate solution. This means removal of a considerable amount of cadmium that causes pollution control problems.

The bath operates at 80°F. Concentration of cadmium can vary from 1/2 ounce to 3 ounces per gallon with 2 1/2 ounces preferred. A lower concentration reduces drag out of cadmium metal. Brightness is maintained with a minimum amount of brightener additions. All in all, the **E-Brite C-135** is truly an outstanding performer.

OPERATING CONDITIONS

E-Brite C-135 is a very easy to maintain process and frequent chemical analysis of the solution is not necessary after the initial break in. However, initially upon preparing a new solution, a careful study, showing the trend of chemical changes and additions made will help in establishing a daily chemical addition schedule. Analysis for cadmium, sodium cyanide and caustic soda should initially be made daily. It is important for maximum speed and efficiency that the cadmium metal to sodium cyanide ratio be maintained at 6:1.

Usually, the cadmium anode area is equal to the cathode area. This may require an adjustment either by removing or adding cadmium anodes until the metal concentration stabilizes. This may take time, but eventually a balance will be obtained where only an occasional metal correction to the solution is required.

Increasing cadmium content in the solution can be corrected by removing part of the cadmium anodes and replacing with insoluble steel anodes to carry the current. A constant anode area should be maintained. Frequent checks should be made and cadmium anodes replenished whenever they are low. If the anode area is allowed to drop too far, the cadmium metal will be plated out of the solution requiring large additions of cadmium oxide.

The **C-135** can also be used in a low cadmium metal bath without a loss of speed or efficiency in low current density barrel operations and with only a slight loss of efficiency in high current density rack plating. The metal content of such a bath is about half that of the conventional cadmium bath and can greatly reduce the amount of drag out, especially in barrel operations. In this bath, 50% of the anode area should be insoluble steel anodes. This ratio may require adjustment either by removing soluble anodes or by adding them as required until the metal concentration remains constant. The sodium cyanide to metal ratio is held at 8:1 to maximize plating efficiency.

Sodium carbonate concentration should be held between 4 oz/gal and 10 oz/gal for maximum benefit. A new solution should be started with only 2 to 4 ounces per gallon. If permitted to rise above 10 oz/gal, the plating speed and efficiency can be greatly reduced. Excess carbonate can be removed by precipitation after cooling the bath to 35° - 40°F, decanting and filtering.

Recommended operating temperatures are between 80° and 85°F. When the temperature falls below 75°F, the bright range will be greatly diminished.

Operating anode current density is 25-30 amps/ft ^{2} and cathode current density should average 1-35 amps/ft^2.

EQUIPMENT AND OPERATION

Tanks:	Mild steel is suitable.
Anodes:	99.5% high purity cadmium (copper and lead free).
Anode baskets:	Titanium.
Ventilation:	Forced ventilation required.
Filtration:	Continuous filtration is required with a rate to turn the solution over once to twice per hour.
Heating:	Not normally required unless ambient temperature causes solution to drop below 75°F.
Cooling:	Not normally required unless applied current and/or ambient temperature cause temperature to go above 90°F.

SOLUTION COMPOSITION

Standard Barrel Plating	Optimum	grams/liter	Range	grams/liter
Cadmium Metal	2.5 oz/gal	18.75	2.0-3.5 oz/gal	15.0 – 26.25
Total Sodium Cyanide	15.0 oz/gal	112.50	12.0-21.0 oz/gal	90.0 – 157.5
Caustic Soda	2.0 oz/gal	15.0	1.5-4.0 oz/gal	11.25 – 30.0
Carbonate, Sodium	4.0 oz/gal	30.0	2.0-10.0 oz/gal	15.0 – 75.0

E-Brite C-135 - 1% by volume
CN/Metal Ratio 6:1
Temperature 80° - 85°F
Anode current density = 25 amps/ft^2

** **E-Brite C-135** and **E-Brite C-135 NN** contain **E-Wet C-135W**. If you need to lower the surface tension or need to remove some pitting, an additional 0.1% by volume of **E-Wet C-135W** can be utilized.

Standard Rack Plating	Optimum	grams/liter	Range	grams/liter
Cadmium Metal	3.0 oz/gal	22.5	2.0-4.5 oz/gal	15.0 – 33.75
Total Sodium Cyanide	18.0 oz/gal	135.0	12.0-27.0 oz/gal	90.0 – 202.50
Caustic Soda	2.0 oz/gal	15.0	1.0-3.0 oz/gal	7.5 – 22.5
Carbonate, Sodium	4.0 oz/gal	30.0	4.0-10.0 oz/gal	30.0 – 75.0

E-Brite C-135 - 1% by volume
CN/Metal Ratio 6:1
Temperature 80° - 85°F
Anode current density = 25 amps/ft^2

Low Metal Barrel Plating	Optimum	grams/liter	Range	grams/liter
Cadmium Metal	1.25 oz/gal	9.375	1.0-1.5 oz/gal	7.5 – 11.25
Total Sodium Cyanide	10.0 oz/gal	75	8.0-12.0 oz/gal	60.0 – 90.0
Caustic Soda	1.5 oz/gal	11.25	0.8-2.0 oz/gal	6.0 – 15.0
Carbonate, Sodium	4.0 oz/gal	30.0	2.0-10.0 oz/gal	15.0 – 75.0

E-Brite C-135 - 1% by volume
CN/Metal Ratio 8:1
Temperature 80° - 85°F
Anode current density = 25 amps/ft^2

Low Metal Rack Plating	Optimum	grams/liter	Range	grams/liter
Cadmium Metal	1.3 oz/gal	9.75	1.0-1.5 oz/gal	7.5 – 11.25
Total Sodium Cyanide	10.0 oz/gal	75.0	8.0-12.0 oz/gal	60.0 – 120.0
Caustic Soda	1.5 oz/gal	11.25	0.8-2.0 oz/gal	6.0 – 15.0
Carbonate, Sodium	4.0 oz/gal	30.0	4.0-10.0 oz/gal	30.0 – 75.0

E-Brite C-135 - 1% by volume
CN/Metal Ratio 8:1
Temperature 80° - 85°F
Anode current density = 25 amps/ft^2

NEW SOLUTION MAKE-UP

Standard Barrel or Rack Plating		grams/liter
Cadmium Oxide	3.75 oz/gal	28.125
Sodium Cyanide	18.0 oz/gal (dissolve first)	135.0
Sodium Carbonate	4.0 oz/gal	30.0
E-Brite C-135	1% by volume	

Low Cadmium Barrel or Rack Plating		grams/liter
Cadmium Oxide	1.75 oz/gal	13.125
Sodium Cyanide	11.0 oz/gal (dissolve first)	82.5
Sodium Carbonate	4.0 oz/gal	30.0
E-Brite C-135	1% by volume	

In each case, the sodium cyanide is dissolved in a storage tank with warm water. The required amount of cadmium oxide is added and stirred vigorously until it is dissolved. The carbonate is then added and thoroughly dissolved. The solution should then be filtered into the plating tank and **C-135** brightener added, as required. Dummy plate for 1 to 2 hours to remove contamination. At this point, the caustic should be analyzed and adjusted to 2.0 oz/gal. This is done at this time because a small amount of caustic is formed by a chemical reaction in the solution upon the addition of Sodium Cyanide and Sodium Carbonate.

BRIGHTENER ADDITIONS

A new bath will require a charge of one gallon of **E-Brite C-135** per 100 gallons of plating solution. The maintenance addition for barrel plating would be one pint of **C-135** for each 10 pounds of Sodium Cyanide added or as needed to maintain the desired brilliance. Rack plating solutions require from one to two pints for each 10 pounds of Sodium Cyanide added.

E-Brite C-135 brightener should be mixed with an equal volume of water to reduce its viscosity if it is to be used with an automated feeder system.

The nickel concentration in the bath should be maintained at 50 ppm. Once this level is reached in the bath, the bath should be maintained with **E-Brite C-135NN** which contains no nickel.

SUGGESTIONS FOR PROPER OPERATION

The solution should be analyzed regularly and controlled for consistent results. Maintain proper temperature and adequate anode area. When brightness decreases below acceptable standards add one or two quarts of **E-Brite C-135** brightener per 1000 gallons of plating solution in either barrel or rack installations.

Submit a sample of the plating solution to our laboratory at regular intervals for analysis and recommendations.

ANALYTICAL PROCEDURES

Cadmium Metal

1. Pipette a 5 ml sample into a 250 ml flask.
2. Add 100 ml water and 25% HCL dropwise until a slight cloud forms.
3. Add 10 ml Conc. Ammonium Hydroxide.
4. Add a few particles of Eriochrome Black T Indicator mixture to produce a deep purple color while stirring.
5. Add 2 grams of Chloral Hydrate (or 20 ml of a 10% solution.) Swirl slightly.
6. Titrate with standard 0.1M EDTA Solution until the color changes red to blue end point. (TITRATION MUST BE DONE IMMEDIATELY AFTER THE ADDITION OF THE CHLORAL HYDRATE.)

Calculations: Cadmium (oz/gal) = ml of EDTA x .30

Sodium Cyanide

1. Pipette a 1 ml sample into 250 ml flask.
2. Add 25 ml water and 10 ml concentrated Ammonium Hydroxide.
3. Add 5 ml 10% KI solution. (AMMONIUM HYDROXIDE MUST BE ADDED BEFORE KI SOLUTION.)
4. Titrate with standard 0.1N Silver Nitrate solution to a faint turbidity. This is the end point.

Calculations: Sodium Cyanide, total oz/gal = ml of 0.1N Silver Nitrate x 1.31

Sodium Hydroxide

1. Pipette a 10 ml sample into a 250 ml flask.
2. Add 10 ml water, 1 gram of Sodium Cyanide and 10 drops of LaMotte Sulfo Orange Indicator solution.
3. Add 2 drops Alkali Blue Indicator.
4. Titrate with standard Hydrochloric Acid (1.0N) to a color change from brown-orange to green.

Calculations: oz/gal of Sodium Hydroxide = ml 1.0N Hydrochloric Acid x 0.535

Carbonates

1. Pipette a 10 ml sample into a 250 ml beaker and add 100 ml distilled (room temperature) water.
2. Add 25-30 ml of 10% Barium Nitrate while stirring. Allow to settle. Test solution in beaker with 2-3 drops of Barium Nitrate to see if precipitate forms. If no more precipitate forms, proceed to step 3. If more precipitate forms add 10 ml of Barium Nitrate, stir and again allow to settle. Repeat this step until precipitate no longer forms upon addition of Barium Nitrate.
3. Filter, using No. 40 paper. Wash with room temperature distilled water.
4. Test filtrate with a few drops of 10% Barium Nitrate to make certain all Carbonates have been precipitated.
5. Transfer filter paper and precipitate to the original beaker and add 50 ml of distilled water. Mush up.
6. Add 3 drops of 0.2% Methyl Orange Solution.
7. Titrate with 1.0N Hydrochloric Acid until a permanent pink is obtained.

Calculations: Sodium Carbonate (oz/gal) = ml 1.0N Hydrochloric Acid x .706

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.**