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COLSID AP-HT

TECHNICAL DATA
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COLSID AP-HT

PROCESS FOR OBTAINING BRIGHT ZINC DEPOSITS FROM FULL AMMONIUM CHLORIDE PLATING BATHS

COLSID AP-HT	is a brightener process for depositing outstanding, brilliant, level, ductile zinc deposits.
COLSID AP-HT	has the ability to produce bright deposits at extreme low current densities, even at high operating temperatures.
COLSID AP-HT	baths operate at extremely high temperatures of 125° F+ (52° C+).
COLSID AP-HT	contains a special ductilizer compound which insures extremely ductile, bright deposits.
COLSID AP-HT	operates with a minimal amount of foam and can be used with air agitation and evaporative recovery.

OPERATING PARAMETERS

RACK AND BARREL BATHS

Zinc Metal:	2.0 - 5.0 oz/gal (15 - 37.5 g/l)
Chloride Ion:	16 - 20 oz/gal (120 - 150 g/l)
COLSID AP CARRIER-HT:	3 - 5% by volume
pH (Electrometric):	5.0 - 5.9
Temperature:	70º - 125º F (22º - 52º C)

SOLUTION MAKEUP

	100 LITERS	100 GALLONS
Zinc Chloride:	4.0 kg	33 pounds
Ammonium Chloride:	17.4 kg	145 pounds
COLSID AP CARRIER-HT:	4 liters	4 gallons
COLSID AP BRIGHTENER-HT *or* COLSID NA-II-O	100 ml *or* 100 ml	13 fl/oz *or* 13 fl/oz

Make sure an ***untreated*** grade of ammonium chloride is used in bath preparation. Commonly marketed grades of ammonium chloride contain additives used to promote its efficacy as a galvanizing flux and these often are detrimental to its use in a plating electrolyte. The bath may be prepared quite simply by dissolving the required amounts of chemicals in hot water. After diluting within 4% of the final volume, the COLSID AP-HT additions should be added.

Make certain that a high purity grade zinc chloride with a maximum of 0.009% heavy metals is used in the bath preparation.

EQUIPMENT

Filtration	Continuous filtration through polypropylene filter tubes of approximately 15 microns is recommended for routine operation. When carbon treatment or another bath purification is necessary, 5-10-micron filter tubes should be substituted.
Equipment	All plating tanks, racks, carriers, etc., which come into contact with COLSID AP-HT solutions should be plastisol, polyethylene, hard rubber, or similarly coated to provide adequate protection from corrosion.
Agitation	Unlike many competitive processes, COLSID AP-HT does not foam excessively and both mechanical and air agitation can be used.
Ventilation	The spray from COLSID AP-HT solutions (not fumes) is inherently corrosive. The use of fiberglass, PVC, or polyethylene ventilation equipment and exhaust fans is recommended to prolong equipment life.
Cooling	Cooling coils made from Teflon are optimum, but titanium coils may be used as long as they are insulated from the electrical circuit. Lead or steel coils are not suitable.

MAINTENANCE ADDITIONS

COLSID AP BRIGHTENER-HT is an economical brightener, which is maintained in the bath at the rate of one gallon per 15,000 to 20,000 ampere-hours. Additions should be made every two to four hours of operation or continuously through the use of an addition agent pump.

COLSID NA-II-O is a highly concentrated solvent-based brightener, which may be used instead of the of the AP BRIGHTENER-HT; it is maintained at the rate of one gallon per 25,000 - 30,000 ampere hours.

COLSID AP CARRIER-HT must be replaced in the plating bath as it is lost by drag-out and tied up and removed by insoluble iron. The most efficient and effective way to replace COLSID AP CARRIER-HT is to add it along with BRIGHTENER additions (COLSID AP BRIGHTENER-HT or NA-II-0) as follows:

<u>LOW DRAGOUT/LOW IRON CONTAMINATION (Most Rack Baths)</u>
add 1-gallon AP CARRIER-HT with each 4-5 gallons BRIGHTENER
(add 1-liter AP CARRIER-HT per 4-5 liters BRIGHTENER)

<u>MEDIUM DRAGOUT (Most Barrel Baths, Some Rack Baths)</u>
add 1-gallon AP CARRIER-HT with each 1-gallon BRIGHTENER
(add 1-liter AP CARRIER-HT per 4-5 liters BRIGHTENER)

<u>HIGH DRAGOUT/HIGH IRON CONTAMINATION (Some Barrel Baths)</u>
add 2 gallons AP CARRIER-HT with each 1-gallon BRIGHTENER
(add 2-liters AP CARRIER-HT per 1-liter BRIGHTENER)

Maintenance of COLSID AP-HT additives should be checked by the use of periodic Hull cell evaluations.

TYPICAL CYCLE

PRE-PLATE TREATMENT

A standard cleaning and pickling cycle is recommended, as follows:

1. Hot alkaline soak clean
2. Hot alkaline electro-clean (anodic or periodic reverse)
3. Rinses
4. 30% to 50% muriatic acid pickle with 1% to 2% PICKLE PAL
5. Rinses
6. Acid Zinc Plate

POST-PLATE TREATMENT

COLSID AP-HT deposits are whiter and brighter than many competitive systems and provide surfaces that are highly receptive to most conventional chromate dips.

ANALYTICAL PROCEDURE

ANALYSIS FOR ZINC METAL

1. Pipette 5 ml bath sample into a 250 ml Erlenmeyer flask and add 100 ml distilled water.
2. Add 10 ml ammonium hydroxide.
3. Add approximately 0.2 gm Eriochrome Black T Indicator Mix.
4. Add 10 ml 8% formaldehyde solution.
5. Titrate immediately with Standard EDTA Solution 0.0575 M to a blue endpoint.

FACTOR: (ml Standard EDTA Solution 0.0575 M) · 0.10 = oz/gal zinc metal

ANALYSIS FOR TOTAL CHLORIDE

1. Pipette 10 ml bath sample into a 250 ml volumetric flask. Dilute to 250 ml with distilled water and mix well.
2. Pipette 10 ml of above dilute solution into a 500 ml Erlenmeyer flask and add 100 ml distilled water.
3. Add 5 ml Sodium Chromate Indicator.
4. Titrate with Standard Silver Nitrate Solution 0.153 N to a reddish-brown endpoint. (The first permanent brown color is the endpoint.)

FACTOR: (ml Standard Silver Nitrate Solution 0.153 N) · 1.82 = oz/gal Chloride

PREPARATION OF ANALYTICAL REAGENTS

EDTA 0.0575 M - dissolve 21.6 gm C.P. Di-sodium EDTA salt in distilled water; dilute to exactly one liter.

Silver Nitrate 0.153 N - add 6 ml Nitric Acid to 26.0 gm C.P. Silver Nitrate; dissolve in distilled water, dilute to exactly one liter.

Formaldehyde 8% Solution - dilute 200 ml 40% C.P. Formaldehyde to one liter with distilled water.

Eriochrome Black "T" Indicator Mix - grind together 1-part indicator and 100 parts sugar.

Sodium Chromate Indicator - dissolve 10 gm sodium chromate in 100 ml distilled water.

HELPFUL HINTS

pH

The pH of bath should be maintained within operating limits by the addition of dilute hydrochloric acid. Care should be taken during pH adjustment as the pH changes quite rapidly with small additions of acid. Hydrochloric acid should be diluted with equal parts water prior to adding to the bath to avoid localized precipitation of addition agents. The pH should be checked using a meter, not pH paper.

Too high pH (over 6.0) causes low current density dullness. Low pH conditions are not normally encountered and occur only if excessive amounts of hydrochloric acid have been added during pH adjustment. If this occurs, dilute ammonium hydroxide or potassium hydroxide may be added to raise the pH to the proper operating level. Ammonium hydroxide is preferred because it is instantly soluble in the bath.

Ammonium Chloride

Ammonium Chloride is the only chemical addition required in the bath during normal operation. It should be added regularly based on periodic analysis for chloride.

The following equivalents should be noted when maintaining the chloride content of the bath:

Ammonium Chloride	contains 66% chloride
Zinc Chloride	contains 52% chloride

Zinc Metal

Zinc Metal is normally maintained by anodic dissolution during electrolysis. High grade zinc slab anodes of minimum 99.99% purity are recommended as an economical anode source. Anodes may be drilled and tapped or used in titanium anode baskets. (Titanium anode baskets should be kept full to avoid damage to the baskets). No dissolution of anodes occurs during idle periods and anodes do not have to be removed from the bath during shutdowns. It is recommended to maintain as much anode area as possible to promote good current distribution. High drag-out barrel operations may require supplemental additions of zinc chloride. Acid resistant anode bags of cotton, dynel, or polypropylene are optional but recommended for rack operation to reduce anode-caused roughness.

Operating Temperature	COLSID AP-HT baths have a very wide range of bright operating temperatures, from approximately 70º F to over 125º F (22º C to over 52º C). The optimum temperature range for best brightness at minimum brightener consumption is 80º F to 85º F (25º C to 28º C), and the bath should be maintained at this temperature whenever economically feasible by cooling coils or refrigeration systems.

CORRECTION OF OPERATING PROBLEMS

PROBLEM	CAUSE & CORRECTION
High Current Density Burning	Poor current distribution...check anode contacts and condition of anodes; clean if necessary. Low AP CARRIER-HT add 1% by volume.
Thin, Non-Level Deposits at Low Current Density	Low chloride...check analysis & add ammonium chloride.
Hazy Deposit: No Response to Brightener and/or Chromating Difficulties	Low cloud point – treat with carbon. 1 lb/1,000-gal bath: treat with potassium permanganate. 1 lb/1,000-gal bath: add NA CLARIFIER at ½% to 1% by volume.
Deposit Roughness	Clean filter. Bag anodes and/or increase anode area for more even anode dissolution.
Black in High Current Density After Chromate – Iron Contamination	Check bottom of tank for fallen parts & remove. Change acid pickle more frequently and use PICKLE PAL in the HCl pickle. Remove iron from plating bath with hydrogen peroxide (1 or 2 pints of 20 volume peroxide per 1,000 gallons plating bath, diluted in one gallon of water). Filter bath.
Black in Low Current Density After Chromate	Metallic contamination: Copper – over 15 ppm Lead – over 5 ppm Cadmium – over 15 ppm Treat with zinc dust (1 lb. Zn dust removes approximately 10 ppm metallic contamination per 1,000 gallons plating bath.)

HANDLING & STORAGE

Columbia Chemical recommends referring to the specific product Safety Data Sheets for safety, handling, and storage precautions.

NON-WARRANTY

The data contained in this bulletin is believed by Columbia Chemical Corp. to be accurate, true, and complete. Since, however, final methods of use of this product are in the hands of the customer and beyond our control, we cannot guarantee that the customer will obtain the results described in this bulletin, nor can we assume responsibility of the use of this product by the customer in any process which may infringe the patents of third parties.