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EXTREME® 210

TECHNICAL DATA
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EXTREME® 210

PROCESS FOR BRIGHT CHLORIDE ZINC PLATING BATHS CONTAINING AMMONIUM CHLORIDE AND POTASSIUM CHLORIDE

EXTREME® 210	produces a brilliant, level, ductile zinc deposit from acid chloride zinc plating electrolytes.
EXTREME® 210	is specially designed for mixed NH4Cl/KCl baths.
EXTREME® 210	baths do not require boric acid, eliminating an extra expense, time consuming analysis, and crystallization on anodes in cold weather.
EXTREME® 210	baths can operate at extremely high temperatures of 125° F+ (52° C+).
EXTREME® 210	contains a special ductilizer compound which insures extremely ductile, bright deposits.
EXTREME® 210	operates with little or no foam and can be used with air agitation and evaporative recovery systems.
EXTREME® 210	is extremely tolerant to organic contaminants such as oils/cleaner surfactants and inorganic contaminants such as iron/copper.

OPERATING PARAMETERS

RACK AND BARREL BATHS

Zinc Metal:	2.0 - 5.0 oz./gal. (15 - 37.5 g/L)
Chloride Ion	16 - 22 oz./gal. (120 - 165 g/L)
EXTREME® CARRIER 210:	3 - 5% by volume
pH (Electrometric):	5.0 - 6.0
Temperature:	70 - 125° F (22 - 52° C)

SOLUTION MAKEUP

	100 LITERS	100 GALLONS
Zinc Chloride:	4.0 kg	33 pounds
Potassium Chloride:	19.0 kg	158 pounds
Ammonium Chloride:	3.5 kg	29 pounds
EXTREME® CARRIER 210:	4.0 L	4 gallons
EXTREME® BRIGHTENER 200:	100 mLs	13 fl/oz
EXTREME® STARTER:	0.5 L	0.5 gallons

The bath is prepared by dissolving zinc chloride, potassium chloride, and ammonium chloride in approximately two-thirds of the final bath volume of hot water. After all the salts have been thoroughly dissolved, **dilute the required amount of EXTREME® CARRIER 210 with at least equal parts of water;** add to the bath and mix until dispersed. Follow the same procedure with the EXTREME® STARTER and the EXTREME® BRIGHTENER 200. Dilute the bath to the final volume and mix well.

Make Up of the bath as above will yield an optimum operating analysis of:

Zinc Metal:	2.5 oz/gal (18.8 g/L)
Chloride Ion:	18.0 oz/gal (135 g/L)
Ratio KCl:NH4Cl*:	5:1
pH (Electrometric):	5.6

NOTE: The ratio between potassium chloride and ammonium chloride is generally maintained at approximately 5:1, ex. for every 100 pounds of chloride ion required, as determined by analysis, add 175 pounds potassium chloride and 34 pounds ammonium chloride.

EQUIPMENT

Filtration	Continuous filtration through polypropylene filter tubes of approximately 15 microns is recommended for routine operation. When carbon treatment or other bath purification is necessary, 5-10 micron filter tubes should be substituted.
Equipment	All plating tanks, racks, carriers, etc., which come into contact with EXTREME® 210 solutions should be plastisol, polyethylene, hard rubber, or similarly coated to provide adequate protection from corrosion.
Agitation	Unlike many competitive processes, EXTREME® 210 does not foam excessively and both mechanical and air agitation can be used.
Ventilation	The spray from EXTREME® 210 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 Coils	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

EXTREME® BRIGHTENER 200 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.

Or

EXTREME® BRIGHTENER 211, a highly concentrated solvent-containing brightener is added to the bath at the rate of one gallon per 25,000 - 30,000 ampere hours of operation.

EXTREME® STARTER is added only at the time of initial make up.

EXTREME® CARRIER 210 must be replaced in the plating bath as it is lost by drag-out.

EXTREME ®CARRIER 210 can also be lost due to frequent treatment for iron. The most efficient and effective way to replace EXTREME® CARRIER 210 is to add it along with EXTREME® BRIGHTENER 200 additions, as follows:

LOW DRAGOUT/LOW IRON CONTAMINATION (Most Rack Baths)
add 1-gallon EXTREME® CARRIER 210 per 4 - 5 gallons of EXTREME® BRIGHTENER 200
(add 1-liter EXTREME® CARRIER 210 per 4 - 5 liters of EXTREME® BRIGHTENER 200

MEDIUM DRAGOUT (Most Barrel Baths)
add 1-gallon EXTREME® CARRIER 210 per 1-gallon EXTREME® BRIGHTENER 200
add 1-liter EXTREME® CARRIER 210 per 1-liter EXTREME® BRIGHTENER 200

HIGH DRAGOUT/HIGH IRON CONTAMINATION (Some Barrel Baths)
add 2 gallons EXTREME® CARRIER 210 per 1-gallon EXTREME® BRIGHTENER 200
add 2 liters EXTREME® CARRIER 210 per 1-liter EXTREME® BRIGHTENER 200

Maintenance of EXTREME® 210 additives should be checked by 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 - 50% MURIATIC ACID PICKLE WITH 1 - 2% PICKLE PAL
5. RINSES
6. ACID ZINC PLATE

POST-PLATE TREATMENT

EXTREME® 210 deposits are whiter and brighter than many competitive systems and provide surfaces that are highly receptive to most conventional blue-bright and yellow passivate 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 buffer solution.
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 (oz/gal x 7.5 = g/L)

ANALYSIS FOR TOTAL CHLORIDE

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

FACTOR: (mL Standard Silver Nitrate Solution 0.153 N) · 1.82 = oz/gal Chloride (oz/gal x 7.5 = g/L)

HELPFUL HINTS

pH

The pH of the 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, diluted 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/ Potassium Chloride

Ammonium Chloride and Potassium Chloride are the only chemical additions required in the bath during normal operation. They should be added on a regular basis 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
Potassium Chloride	contains 48% chloride
Zinc Chloride	contains 52% chloride

Therefore, to raise chloride content 1.0 oz/gal (7.5 g/L) requires:

0.34 oz/gal (2.5 g/L) ammonium chloride and 1.75 oz/gal (13 g/L) potassium 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. 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. Anode baskets should be kept full. Acid resistant anode bags of cotton, dynel, or polypropylene are recommended for rack operation to reduce anode-caused roughness
Operating Temperature	EXTREME® 210 baths have a very wide range of bright operating temperatures, from approximately 70 - 120° F (22 - 48° C). The optimum temperature range for best brightness at minimum brightener consumption is 80 - 85° F (25 - 28° C), and the bath should be maintained at this temperature whenever economically feasible by cooling coils or refrigeration systems.

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.