HAVABLACK CHROMATE FOR ZINC
Silver Based, High Gloss, Jet Black Chromate on Zinc

The HAVABLACK CHROMATE for ZINC is a simple and efficient process for applying a single stage Black Chromate on zinc plate.

The HAVABLACK CHROMATE system consists of three liquid products:

CHROMATER 50: Make up and maintenance, activity adjuster.
HAVABLACK 50: Added in a ratio of one gallon for each gallon of Chromater 50 for make up and two to one for maintenance.
HAVABLACK CATALYST: Used in the initial make-up only.

EQUIPMENT

The HAVABLACK CHROMATE process can only be installed in stainless steel, polyethylene, or PVC lined tanks. The use of mild steel tanks, lead liners, aluminum liners, lead or copper heating coils, is not recommended.

Very mild agitation is important. Filtered, oil free air agitation that just rolls the solution is recommended.

BATH PREPARATION

The HAVABLACK CHROMATE process is prepared as follows:
A. Fill the tank 3/4 full of Deionized Water and heat to 85°F.
B. Add 7% of the tank volume of Havablack Catalyst.
C. Add with mixing 7% of the tank volume of Havablack 50.
D. While mixing and with a temperature of 75°F minimum add slowly Chromater 50 at the rate of 7% of the tank volume. If 75°F minimum is not maintained during this step the new bath will produce a brown and dull finish and will require reheating to 140-150°F.
E. Adjust the pH of solution to the proper level by adding 1 1/3 oz/gal of chloride free caustic soda (Reagent Grade, Rayon Grade or HP DI Resin Grade). Do not use technical grade caustic soda for pH adjustments.
F. Adjust the solution volume and temperature to normal operating levels: 70 - 85°F. Maintain mild agitation during adjustments.

This solution will have an orange-brown, turbid appearance. This turbidity is normal and does not interfere with operation. Do not filter this solution. Disposal of the solution may be necessary only in cases of extreme contamination. Principal contaminants are chlorides, nitrates in very large quantities, lead, iron, copper, and most heavy metals.

A typical cycle for application of HAVABLACK CHROMATE would be:

1. Zinc Plate
2. Rinse
3. 1% Nitric Acid or 0.5% Sulfuric Acid (optional)
4. Rinse
5. HAVABLACK CHROMATE
6. Cold Rinse (NOT over 90°F)
7. Dry

Note: If using Nitric Acid or Sulfuric Acid, rinsing prior to chromating is critical.
OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Activity*</th>
<th>Range</th>
<th>Optimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baume</td>
<td>5.0 - 15.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Temperature</td>
<td>70 - 90°F</td>
<td>80°F</td>
</tr>
<tr>
<td>pH</td>
<td>1.6 - 2.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Agitation: Slight rolling air agitation. If bath has been idle for some time, agitate for 15 - 30 minutes before using.

* Activity is determined by Haviland’s Standard Analytical Procedure as given of Page 3 of this bulletin.

MAINTENANCE AND CONTROL

During operation of Haviland's Havablack Chromate bath, the pH tends to increase and solution activity decreases. Adjustments should be made daily before use. All additions should be made while agitating the solution.

To increase activity, add 1% of Chromater 50 for each 0.6 units of activity increase desired. For each 1% increase of Chromater 50, add 2% of Havablack 50 in order to maintain a balanced solution.

To lower pH, add Sulfuric Acid in increments of one pint per 100 gallons of solution. pH value should be checked after each addition.

Note: The use of sulfuric acid should be kept to a minimum, even avoided if at all possible. It is used only when activity is acceptable and pH is still high.

TROUBLE SHOOTING

The Black Chromate finish can only be as good as the zinc plate. When the zinc plate is satisfactory, the black finish should be lusterous and free of iridescence. (Minimum suggested zinc thickness 0.0003 inches.) There are six variables that control the black finish: Condition of the zinc plate, pH, concentration, temperature, time and contamination. The following Trouble Shooting chart offers suggestions for maintenance and operation of the Havablack Chromate Bath.

<table>
<thead>
<tr>
<th>If the Finish is:</th>
<th>Possible Trouble:</th>
<th>Remedy (Apply In Order Listed):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iridescent (Black)</td>
<td>1. Activity too low</td>
<td>1. Increase activity to 4.0 - Always check activity prior to pH, CHROMATER 50 will automatically decrease pH</td>
</tr>
<tr>
<td></td>
<td>2. pH too high</td>
<td>2. Adjust to 1.8 with Sulfuric Acid</td>
</tr>
<tr>
<td></td>
<td>3. Temperature too high</td>
<td>3. Reduce temperature to 85°F</td>
</tr>
<tr>
<td>Olive Drab or Brown Finish and pH and Temperature are in range</td>
<td>1. Improper ratio of Havablack 50</td>
<td>1. a. Agitate for 10 minutes</td>
</tr>
<tr>
<td></td>
<td>2. Activity too low</td>
<td>2. Increase activity to 4.0</td>
</tr>
<tr>
<td></td>
<td>3. Dip time too short</td>
<td>3. Increase dip time to 2-3 min</td>
</tr>
<tr>
<td></td>
<td>4. Contamination</td>
<td>4. Remove source of contamination (Chlorides)</td>
</tr>
<tr>
<td>Dull, stained or rough</td>
<td>1. Improper rinsing before Black Chromate</td>
<td>1. Increase rinsing</td>
</tr>
<tr>
<td></td>
<td>2. Improper rinsing after Black Chromate</td>
<td>2. Increase rinsing or decrease rinsing</td>
</tr>
<tr>
<td></td>
<td>3. Condition of zinc plate</td>
<td>3. Adjust zinc bath and/or Nitric or Sulfuric Acid bright dip</td>
</tr>
<tr>
<td></td>
<td>4. Rinse after black chromate</td>
<td>4. Lower temperature to 85°F</td>
</tr>
</tbody>
</table>
TROUBLE SHOOTING (Cont’d)

If the Finish is: Possible Trouble: Remedy (Apply In Order Listed):

Dull, stained or rough (Cont’d) 5. Nitrate contamination 5. Increase activity to high limit with CHROMATER 50 and increase rinsing if using Nitric Acid bright dip
6. Solution too concentrated 6. Dilute 10% and then check activity

Plate is removed 1. Plate too thin 1. Plate thickness 0.3 mil. required for new bath
2. Temperature too low 2. Increase temp. to 75°F
3. Activity too low 3. Increase activity to 4.0 - Check prior to pH
4. pH too low 4. Increase pH to 1.8 with caustic soda

If a laboratory is available, the direction indicated above should be tried in the lab before alterations are made on the production bath.

HANDLING OF HAVABLACK CHROMATE CHEMICALS

Chromater 50, Havablack 50, and Havablack Catalyst are highly acidic. Contact with any must be avoided. Protective gloves, face shield and apron should be worn when transferring these chemical products to the process tank. Avoid breathing of fumes or vapors of these products. Chromater 50 contains chromic acid, a powerful oxidizing agent. Do not allow Chromater 50 to come in contact with reducing agents such as Sodium Hydrosulfite, Sodium Bisulfite or organic compounds such as oils, greases or paper. Large spills of Chromater 50 will require hexavalent chrome reduction and neutralization prior to flushing to drain. Spills of Havablack 50 and Havablack Catalyst require neutralization prior to flushing to drain. KEEP PRODUCT FROM FREEZING!!!

WASTE DISPOSAL

Solutions of Havablack Chromater contain hexavalent chromium and are acidic. Therefore, the rinse waters and process solution require chromium reduction and precipitation and a pH adjustment to local ordinance standards. Informational bulletins on hexavalent chromium reduction are available on request from Haviland’s Research Division.

ANALYTICAL METHODS OF CONTROL

CHROMATER 50 Concentration

Procedure:  
A. Pipette a 2 ml sample of chromate solution into a 250 ml Erlenmeyer flask.
B. Add 25 ml of a 1:1 Hydrochloric Acid, (1:1 Sulfuric Acid may be used), and 30 ml of distilled or deionized water.
C. Add 1 gram of Ammonium Bifluoride
D. Add 10 ml of a 10% Potassium Iodide Solution.
E. Titrate with 0.1N Sodium Thiosulfate (Na₂S₂O₃) to a reddish-yellow color.
F. Add 2-5 ml of a 1% Starch indicator solution (solution will turn dark).
G. Continue to titrate with Na₂S₂O₃ until a clear green end-point is reached.

Calculations:

(\text{ml titrated Na}_2\text{S}_2\text{O}_3) \times (\text{N Na}_2\text{S}_2\text{O}_3) \times 2.2 = \text{CHROMATER 50 Activity}

\text{CHROMATER 50 Activity} \times 1.75 = \% \text{ by Volume CHROMATER 50}
ANALYTICAL METHODS OF CONTROL (Cont'd)

HAVABLACK CATALYST Concentration

Procedure:
A. Pipette a 2 ml sample of chromate solution into a 250 ml Erlenmeyer flask.
B. Add approximately 30 ml of DI Water.
C. Add 4 to 5 drops of Phenolphthalein indicator.
D. Titrate with 1.0N Sodium Hydroxide (NaOH) until the solution turns to a pink end-point.

Calculation:

\[(\text{ml titrated NaOH}) \times (\text{N NaOH}) \times 1.5 = \% \text{ by Volume } \text{HAVABLACK CATALYST}\]

NON-WARRANTY

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