



Technical Data Sheet

CHEMEON TCP-HF™

A ROHS, REACH, WEEE, ELV and OSHA PEL compliant chromium (III) conversion coating used for immersion and spray applications

PRIMARY APPLICATIONS

CHEMEON TCP-HF* is a chemical conversion coating for aluminum alloys, magnesium, zinc and zinc alloys, as well as a sealer for anodized aluminum. It produces a protective coating on metal, which minimizes corrosion as well as improves adhesion capabilities of the surface.

Applications include (but are not limited to):

- Sealant for aluminum anodic surfaces
- Hexavalent chromium-free passivation on aluminum, zinc, zinc alloys, and magnesium
- Excellent bare metal corrosion protection on aluminum that is comparable to hexavalent chromium chemistry
- Provides an excellent adhesive surface when used as a pretreatment for paint and powdercoat applications, which results in extended corrosion resistance
- Meets MIL-DTL-81706B and MIL-DTL-5541F (revision of MIL-C-5541E) class 1A & class 3 for bare corrosion protection
- U.S. Patent Number 6,375,726 (PCT/US 01/45434); 6,511,532 (PCT/US 02/35599); 6,521,029; and 6,527,841 (PCT/US 02/35490)

CHEMICAL CHARACTERISTICS:

chemical composition.....trivalent chromium salt
 physical form.....liquid (light green)
 odor.....none
 bulk density.....8.5 lbs/gal
 pH, concentration.....2.0 – 3.5
 flash point.....not applicable
 recommended diluents.....water
 rinsability.....good
 water solubility.....complete

* Metalast TCP-HF prior to June 10, 2015

APPLICATION PROCEDURE

General operating conditions for use as a chemical conversion coating:

Method of application:	Soak or spray
Concentration:	10-50% by volume, depending on application
Water for make-up:	DI water is preferred
Temperature:	65-120° F
Time:	1-10 minutes
pH:	3.85 (3.6-4.0) <i>do not operate above 4.0</i>
pH adjustments:	Use 5-20% sulfuric acid or 10-40% Enprox 702 to lower the pH. Use 5-20% potassium hydroxide, 5-20% sodium hydroxide, 5-20% ammonium hydroxide to increase the pH Note: pH adjustments should be made very slowly using continuous mixing
Tank material:	Polypropylene, Koroseal-lined, 316 Stainless Steel, or Teflon-lined Note: Before initial charge, thoroughly clean the tank For new tanks or liners, rinse surfaces with the acid chemistry of choice for lowering pH, then rinse thoroughly with water
Heater material:	Teflon coated heater

General operating conditions for use as an anodic seal:

Method of application:	Soak
Concentration:	5-25% by volume, depending on application
Water for make-up:	DI water is preferred
Temperature:	65-85° F
Time:	1-10 minutes
pH:	<i>do not operate above 4.0</i>
pH adjustments:	Use 5-20% sulfuric acid or 10-40% Enprox 702 to lower the pH. Use 5-20% potassium hydroxide, 5-20% sodium hydroxide, 5-20% ammonium hydroxide to increase the pH. Note: pH adjustments should be made very slowly using constant mixing.
Tank material:	Polypropylene, Koroseal-lined, or 316 Stainless Steel or Teflon-lined tank

Note: Before initial charge, thoroughly clean the



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Heater material: **tank.** For new tanks or liners, rinse surfaces with the acid chemistry of choice for lowering pH and then rinse thoroughly with water
Teflon coated heater

Application on bare aluminum:

To achieve maximum results, bare aluminum must be cleaned and activated prior to treatment with CHEMEON TCP-HF.

Excellent results have been obtained using a mild alkaline cleaner at the lower end of its operating temperature range. Typically, etching cleaners do not perform as well in applications where corrosion resistance is imperative. Some suggested cleaners are CHEMEON Cleaner1000 and CHEMEON Cleaner 1000 SP (spray applications). Surface activation can be performed using a strong acid such as nitric at 50%.

The pH of a CHEMEON TCP-HF bath should be critically monitored and the tank should have agitation capabilities for use while making pH adjustments. During passivation, stagnant bath is recommended but agitated bath can also be used. **No violent or forceful agitation.**

Filtering can be done with 5 - 20 micron non-ion exchange filters.

For applications on previously coated and stripped substrates or touch-up field repairs, contact the CHEMEON Technical Center at 1-888-782-8324 or info@chemeon.com

Performance on bare aluminum:

Electrical conductivity and adhesion test specifications in accordance with MIL-DTL-81706B and MIL-DTL-5541F (revision of MIL-C-5541E) are easily met when CHEMEON TCP-HF is applied. When using the recommended process, corrosion resistance to 336 hours salt spray is obtainable.

Application on anodized aluminum:

CHEMEON TCP-HF can be used as a seal for most anodized aluminum surfaces including but not limited to Type IIB Thin Film and Type II colorless, dyed, electrolytically colored coatings, and more.

The anodized aluminum must be rinsed well before immersion in the seal tank. After treatment with CHEMEON TCP-HF, very little rinsing is needed. 10-30 seconds in clean, room temperature water is suggested for a post-seal rinse.



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For use with dyed surfaces, excluding those that have been electrolytically modified, use a low concentration of CHEMEON TCP-HF with a long immersion time to obtain maximum color retention.

For electrolytically colored surfaces, the best results have been achieved by using a high concentration of CHEMEON TCP-HF with a mid-range immersion time.

Performance on anodized aluminum:

For all concentrations and immersion times outlined in the General Operating Conditions section of this technical data sheet, CHEMEON TCP-HF provides an excellent base coat for adhesion applications and will provide corrosion resistance in accordance with ASTM B117 to 3,000+ hours.

Application on non-aluminum substrates:

For specific applications and process parameters contact the CHEMEON Technical Center at 1-888-782-8324 or info@chemeon.com

Application on Zinc-Nickel Plated Steel Parts:

In order to meet or exceed the corrosion requirements of BAC5637 and AMS 2417, the following processing steps should be followed:

- 50% v/v CHEMEON TCP-HF
- pH 3.85
- 90-120F
- 3-5 minute immersion
- DI rinse (0.1 min)
- Forced air dry (or just air dry)

Bath Makeup and Maintenance

Bath makeup:

- Fill the tank half full with deionized water
- Adjust the pH of the water to approximately 3.4 with pH-decreasing chemistry specified above (a very small amount will be required)
- Add the desired amount of CHEMEON TCP-HF to the tank with continuous mixing
- Fill the tank to operating level
- Adjust the pH of the tank to 3.6-3.8 using pH-increasing chemistry. ***ADD chemistry very slowly while mixing to avoid damage to the bath.**

Older tanks:



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Over time, a small amount of precipitate may form in the tank. This is normal. If the pH of the solution rises above 4.0, an unacceptably large amount of precipitate may form. DO NOT FILTER because the precipitate has active ingredients that will be removed.

Contact the CHEMEON Tech Center for assistance in re-dissolving the precipitate.

Bath maintenance:

- The pH of the bath should be checked regularly. It is important that the pH of the bath doesn't exceed 4.0
- Replenishment due to drag out should be made with CHEMEON TCP-HF in water at the same concentration the bath was made. For example, if the bath is made up at a nominal 25% concentration, drag out should be replenished with a 25% solution of CHEMEON TCP-HF
- Measurement of the bath concentration may be accomplished by using spectrophotometry

The CHEMEON TCP-HF technical service group provides free monthly evaluation of concentration and pH. Please contact the CHEMEON Tech Center if you are interested in this service at 1-888-782-8324 or info@chemeon.com

Solution Control by Spectrophotometry

Equipment:

Spectrophotometer
Glass cuvette
Plastic pipettes
500ml Graduated cylinder
1L volumetric flask
1L storage bottles
Fine porosity filter paper x 1 per bath sample
Graphing software or the ability to calculate the equation of a line

Using a spectrophotometer is an easy and accurate way to measure the concentration of a CHEMEON TCP-HF bath. CHEMEON TCP-HF standards should be made in sets of three at concentrations that bracket the target concentration of the bath. For example, if 25% is the operating concentration, your standards should be 10%, 25%, and 50% by volume.

Procedure for making one liter 10%, 25%, and 50% standards:

1. To make a 50% by volume standard, measure 500 ml of CHEMEON TCP-HF concentrate with the graduated cylinder and pour the contents into the volumetric flask.
2. Fill the volumetric flask to the 1L mark with deionized water.
3. Put the cap on and mix thoroughly.
4. Pour the contents into a storage bottle and label the bottle with the date, concentration, and chemical for storage.
5. Repeat steps 2-5 for the 25% and 10% standards but use 250ml CHEMEON TCP-HF for the 25% standard and 100ml CHEMEON TCP-HF for the 10% standard.
6. New standards should be made every two months. If they become cloudy or experience precipitation before then, discard and make new ones.

Procedure for analyzing CHEMEON TCP-HF bath sample:

1. Turn on the spectrophotometer. Allow the lamp to warm up according to manufacturer's specifications.
2. In the mean time, filter approximately 50-100 ml of your bath sample through fine porosity filter paper.
3. Set the wavelength of the spectrophotometer to 605nm.
4. Fill the quartz cuvette with deionized water and wipe down the outside walls of the cuvette so they are free of fingerprints, streaks, and moisture.
5. Place the cuvette in your spectrophotometer and "zero" the instrument according to manufacturer's specifications.
6. Measure the absorbance value of the deionized water according to the manufacturer's specifications. Record this value. It should be very close to zero.
7. Using a clean plastic pipette, refill the cuvette with one of your CHEMEON TCP-HF standards, clean the walls of the cuvette again then place it in your spectrophotometer.
8. Measure and record the absorbance value.
9. Repeat steps 4 through 8 for the other two standards and the filtered bath sample.
10. Plot the absorbance versus concentration for your standards on a graph and determine the equation of the line. Microsoft Excel or a graphing calculator can be used for this.
11. Plug the absorbance of the bath sample into the equation to obtain the concentration.

If you need assistance with this you can call the CHEMEON Tech Center and they will provide you with a Microsoft Excel spreadsheet that will calculate the concentration for you.

If you are interested in quotes for a spectrophotometer or other related equipment, please contact CHEMEON at 1-888-782-8324 or info@chemeon.com

Solution Control by Titration

The solution concentration may be measured using a redox titration. The trivalent chromium in the solution is oxidized to hexavalent chromium using hydrogen peroxide. The hexavalent chromium content is then measured using a redox titration.

Required Materials

- Stirring hotplate
- 100 mL pipet
- pipet bulb
- 50 mL burette
- 50 mL graduated cylinder
- filter funnel
- fine grain filter paper
- 250 mL Erlenmeyer flask
- 10% w/w sodium hydroxide
- 30% hydrogen peroxide
- 17% v/v hydrochloric acid
- potassium iodide
- 0.1N sodium thiosulfate
- 1% starch solution

Procedure

1. Pipette 100 mL CHEMEON TCP-HF into a 250 mL Erlenmeyer flask
2. Add approximately 20 mL sodium hydroxide solution
3. Add approximately 5mL hydrogen peroxide, stirring for 5 minutes
4. Add another 5 mL hydrogen peroxide, stirring for an additional 5 minutes
5. Boil the solution for 30 to 40 minutes to remove excess hydrogen peroxide. The solution will be highly effervescent at first. Be careful to avoid boiling the solution over. Do not allow the solution to evaporate below 50 mL
6. Cool the solution and bring the volume to approximately 100 mL with deionized water
7. Filter the solution through a fine grained filter paper. Rinse the filter paper and precipitate using a washbottle filled with deionized water until it is colorless. Retain the filtrate
8. Important: the filtrate must not be cloudy. If the filtrate is cloudy it must be refiltered
9. Make sure the titration apparatus is prepared. The burette should be prepared with 0.1N sodium thiosulfate
10. Add 40 mL hydrochloric acid to the filtrate. The filtrate will turn from yellow to orange
11. Add approximately 1 g potassium iodide



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12. Immediately titrate the solution with 0.1N sodium thiosulfate until the solution is pale red-brown
13. Add 2 mL of starch solution and titrate to endpoint (mint green)

Calculation

Conc. CHEMEON TCP-HF (% by vol.) = Volume in mL 0.1N sodium thiosulfate consumed

SAFETY AND HANDLING

Prior to handling and use of any of the materials referenced in this document, the Safety Data Sheets should be read and understood by all personnel in contact with these materials. Eyes and skin should be protected with appropriate personal protective equipment. Do not ingest. Having eyewash fountains and emergency showers in close proximity is recommended.

KEEP OUT OF REACH OF CHILDREN

STORAGE

It is recommended to store CHEMEON TCP-HF in dry, indoor storage at temperatures between 40°F and 100°F. Keep the product away from any incompatible materials referenced in the Safety Data Sheets. All containers should be tightly closed when not in use. There is a 2-year shelf life on the product.

DISPOSAL

Any disposal of the materials referenced in this document should be in accordance with all applicable federal, state, and local regulations. The process solution can contain components other than those present in the materials as supplied. Analysis of process solutions may be required prior to disposal.