



Technical Process Bulletin

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NOVACOAT 1100
 Conversion Coating Process for Aluminum

1. Introduction:

NOVACOAT 1100 is a concentrated acidic liquid product used to produce a chromate conversion coating on aluminum and all its alloys. NOVACOAT 1100 is non complex cyanide accelerated and can be applied by immersion or spray applications to produce lighter colorless or heavier colored coatings.

When used via immersion and as recommended, NOVACOAT 1100 meets all of the requirements of MIL-C-5541, Classes 1A and 3, Form 1, Method C, as they conform to MIL-C-81706.

2. Operating Procedure:

<u>Chemical:</u>	<u>Bath Preparation per 100 Gallons:</u>
NOVACOAT 1100	0.5 - 5 gallons
<u>Immersion Operation and Control:</u>	
<u>Standard Color Coatings (25 to 80 mg/ft.²)</u>	
NOVACOAT 1100 (concentration):	3 - 5 gallons (11.3 - 19 liters)
Optimum (concentration):	5 gallons (19 liters)
Fluoride Level:	450 to 900 ppm
Fluoride Level (optimum concentration):	600 to 900 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 1.8
Temperature, °F:	90° to 110° (32° to 43°C)
Time, minutes:	2 to 5
<u>Lighter Color Coatings (15 to 25 mg/ft.²):</u>	

NOVACOAT 1100 (concentration):	1.5 - 3 gallons (5.7 - 11 liters)
Fluoride Level:	250 to 500 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 1.8
Temperature, °F:	80° to 100° (27° to 38°C)
Time, seconds:	20 to 40

Colorless Coatings (5 to 10 mg/ft²):

NOVACOAT 1100 (concentration):	1 - 2 gallons (3.8 to 7.5 liters)
Fluoride Level:	100 to 300 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 1.8
Temperature, °F:	80° to 100° (27° to 38°C)
Time, seconds:	10 to 25

Spray Operation and Control:

Standard Color Coatings (25 to 80 mg/ft²):

NOVACOAT 1100 (concentration):	1 - 3 gallons (3.8 to 11 liters)
Fluoride Level:	100 to 500 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 1.8
Temperature, °F:	90 to 120° (32 to 49°C)
Time, minutes:	1.5 to 2.5

Lighter Color Coatings (15 to 25 mg//ft²):

NOVACOAT 1100 (concentration):	1 to 2 gallons (3.8 to 7.5 liters)
Fluoride Level:	100 to 300 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 1.8
Temperature, °F:	80 to 100° (27° to 38°C)
Time, seconds:	10 to 20

Colorless Coatings (5 to 10 mg/ft²):

NOVACOAT 1100 (concentration):	0.5 to 1 gallon (2 to 4 liters)
Fluoride Level:	70 to 100 ppm
pH:	1.6 to 2.4
pH (optimum):	1.6 to 2.0
Temperature, °F:	80° to 100° (27° to 38°C)
Time, seconds:	5 to 15
Note: The washer conveyor speed will dictate the actual time of the spray.	

3. The Process:

The complete process sequence for the NOVACOAT 1100 treatment normally consists of the following steps:

- A. Non-Etch Cleaning
- B. Water rinsing
- C. Deoxidizing for Mil-C-5541, Class 3; optional for Class 1A
- D. Water rinsing
- E. Treating with the NOVACOAT 1100 processing solution
- F. Water rinsing
- G. Post treatment (optional)
- H. Drying.

4. Materials:

NOVACOAT 1100
Nitric Acid, dilute
Sodium hydroxide, dilute
Testing Reagents and Apparatus

5. Equipment:

Process tank and housing should be fabricated from stainless steel, such as 316L or 304L. The 316L being preferred for maximum tank life. In all cases, approved welding techniques must be used. Polyvinyl chloride (PVC) or CPVC lined mild steel can be used. In spray applications, nozzles fabricated from 300 series stainless steel are preferred.

Process piping and pumps should be constructed of 316 or 304 stainless steel alloys. Various formulations of plastic pipe may be used with recommended support spacing, Schedule-80 being generally recommended. PVC Type I is limited to maximum process temperatures of 140° Fahrenheit. CPVC and PP may be used up to a maximum process temperature of 190° Fahrenheit. PVDF may be used for all expected operating temperatures.

Heat exchanger plates should be polished 316 stainless steel. Gas fired burner tubes are not recommended. All process circulation pump seals, valve seats, door seals, etc., which come into contact with the process solution and occasional acid equipment cleaners, should be EPDM, Viton™ or Teflon™.

Chemical feed pump parts and all other elastomers which may come into contact with the concentrated replenishing chemical should be Viton or Teflon.

Support equipment available from Henkel Surface Technologies for this process includes: chemical feed pumps, level controls, transfer pumps and bulk storage tanks.

Our sales representative should be consulted for information on Henkel Surface Technologies automatic process control equipment for this process and any additional questions. In addition, the "Henkel Surface Technologies Equipment Design Manual" may be consulted.

6. Surface Preparation:

Cleaning:

All metal to be treated with the processing solution must be free from grease, oil and other foreign matter before the treatment. A complete line of cleaners is available and our representative should be consulted.

Water Rinsing:

After cleaning, the metal must be thoroughly rinsed with water. The rinse should be overflowed continuously at a rate which will keep it clean and free from scum and other contamination.

Deoxidizing (optional):

When aluminum is to be treated with NOVACOAT 1100 processing chemical for Class 3 coatings or if the surface has corrosion products or heavy oxides, it should be conditioned by installing two additional stages between the post cleaner rinse and the NOVACOAT 1100 treatment step. One is for deoxidizing with a deoxidizing chemical and one is for an additional cold water overflowing rinse.

7. Treating with the NOVACOAT 1100 Processing Solution:

Buildup:

Acid proof equipment is required. Fill the tank about three-fourths full with D.I. or softened water, temperature 90° to 100° Fahrenheit (32° to 38°C). For each 100 gallons of final solution volume, add the required gallons of NOVACOAT 1100 and circulate or thoroughly mix. Finally, add sufficient water to bring the solution up to the working level and then heat, if necessary, to the desired operating temperature.

Each alloy reacts with the NOVACOAT 1100 solution to produce a coating that is characteristic of that alloy. The NOVACOAT 1100 bath chemistry such as concentration, pH, and fluoride level should be adjusted to accommodate the mixture of alloys and the aluminum surface conditions being processed. Performance of the coatings being produced and conformance to all of the specifications governing the process must always be considered along with bath control parameters.

8. Testing and Control:

Never pipet by mouth, use a pipet filler.

Solution Control:

The NOVACOAT 1100 concentration is checked by the following procedure:

1. Take a 25 ml sample of NOVACOAT 1100 bath and place into an Iodine flask.
2. Add 75 mls of distilled water, 10 mls of Reagent Solution 44 and approximately 2 grams of Reagent 2 (approximately 1/2 to 3/4 teaspoonful).
3. Stopper the flask and seal with water. Swirl to mix. Allow to stand for 5 minutes.
4. Titrate with Titrating Solution 104 until a light straw color is obtained.
5. Add approximately 5 mls of Indicator 10.
6. Continue titrating with Titrating Solution 104 until a sudden color change to light blue or blue-green is obtained. Record the total number of mls of Titrating Solution 104 required.

7. Calculation:

% by volume NOVACOAT 1100 present = (mls of Titrating Solution 104 required) x 0.11

pH Adjustment:

Always make any needed additions of water or NOVACOAT 1100 to the bath and allow for complete mixing before adjusting the pH.

If needed, dilute sodium hydroxide (caustic) or dilute ammonium hydroxide can be used to raise the pH of the solution. Dilute nitric acid can be used to lower the pH of the bath.

Notes:

1. The quality of the water used to prepare solutions has an important influence on the quality of the NOVACOAT 1100 coating. For best results, demineralized water is preferred.
2. Cold water must be used when rinsing.
3. Stainless steel alloys (316 or 304 ELC) are recommended. Heating coils may be 316 or 304 ELC stainless steel.
4. Keep the concentrate as well as solution of NOVACOAT 1100 away from combustible, organic or readily oxidizable materials. Avoid contact or mixing with materials containing chlorine.

NOVACOAT 1100 Free Fluoride Control Method Using a Direct Readout Specific Ion Meter:Equipment:

Orion Specific Meter
10 ml Plastic Pipette
100 ml Plastic Volumetric Flask
250 ml Plastic Beaker

Reagent:

1. NOVACOAT 1100 Fluoride/chrome Standard Solutions, 100 ppm and 1000 ppm provided by Henkel Surface Technologies.
2. Sodium Acetate Buffer Solution, provided by Henkel Surface Technologies.

Sample Preparation:

1. Pipette 10 ml of sample in 100 ml plastic volumetric flask. Fill up to the mark with Sodium Acetate Buffer Solution.
2. The temperature of the sample and standard solution should be at $70^{\circ} \pm 2^{\circ}\text{F}$ ($21^{\circ} \pm 2^{\circ}\text{C}$), the difference in temperature between the standard and the sample must be no more than 2°F .

Procedure:

1. Standardize the Ion Selector Meter with 100 and 1000 ppm NOVACOAT 1100 Standard Fluoride solutions.
2. Read out the direct reading for the ppm fluoride in the sample.

Note:

The above method gives the direct concentrations of Free Fluoride (ppm) in the NOVACOAT 1100 bath.

9. After Treatment:Water Rinsing:

After treating with NOVACOAT 1100 the work should be thoroughly rinsed in clean cold water. The rinse should be continuously overflowed such that the main body of the rinse never becomes excessively contaminated.

Post Treatment:

The NOVACOAT 1100 treated metal may be treated with an acidic post treatment solution. The post treatment adds to the overall quality of the coating and prevents the formation of hard water salts blistering. In some cases the post treatment stage may be heated to facilitate work drying.

Drying:

Parts coming from the final water rinse or post treatment step can be dried in an indirectly fired oven or by any other means which will not contaminate the metal with fumes, oil, or partially burnt gases. Peak metal temperature should not exceed 120° Fahrenheit.

10. Storage Requirements:

Store in cool, dry area away from strong alkaline, chlorine containing compounds and organic materials. Do not allow NOVACOAT 1100 to freeze.

11. Waste Disposal Information:

Applicable regulations covering disposal and discharge of chemicals should be consulted and followed.

Disposal information for NOVACOAT 1100 is given on the Material Safety Data Sheet for the product.

The processing bath is acidic and contains chromium and complex fluorides. Waste treatment and neutralization will be required prior to discharge. (Refer to Waste Treatment Information Bulletin WT1004, available on request.)

12. Precautionary Information:

When handling the chemical products used in this process, the first aid and handling recommendations on the Material Safety Data Sheet for each product should be read, understood and followed.

The processing bath is strongly acidic and can cause irritation of the skin and eyes. Do not get in eyes or on skin or clothing. In case of contact, follow the Emergency and First Aid Procedure recommendations on the Material Safety Data Sheet for NOVACOAT 1100.

The processing bath contains chromic acid in excess of 0.1% when prepared as recommended. The following statement, or one similar to it, should be included as part of the process tank labeling [29 CFR 1910.1200(f)(4)].

"POSSIBLE CANCER HAZARD, CONTAINS CHROMIC ACID WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure."

Refer to the Material Safety Data Sheet for additional information.

Testing Reagents and Apparatus
 (Order only those items which are not already on hand.)

<u>Code</u>	<u>Quantity</u>	<u>Item</u>
205700	1	Buret Assembly, 25-ml Automatic, Glass
205897	2*	Flasks, iodimetric, 250-ml
205852	2*	Graduated Cylinder, 50-ml, Glass
205010	250 ml	Indicator 10 (0.5% starch solution)
205590	1	Indicator Dropping Bottle, 2 oz
205876	2	Pipet, 5-ml, plastic
205082	450 gm	Reagent 2 (KI)
205244	2.5 liters	Reagent Solution 44 (50% H ₂ SO ₄)
205980	1	Thermometer, Floating
205104	1.0 liters	Titrating Solution 104 (0.1N Na ₂ S ₂ O ₃)

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