Technical Process Bulletin

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ALODINE® 1200S
Aluminum Conversion Coating Process, Immersion Application

1. Introduction:

ALODINE 1200S is a powdered chemical used to produce a protective coating on aluminum which minimizes corrosion and provides an improved bond for paint. Surfaces treated with the ALODINE 1200S process range in color from a light iridescent golden to tan.

ALODINE 1200S coating chemical listed on Qualified Product List QPL-81706, is an approved material to produce Class 1A and Class 3 coatings, bare or painted, in accordance with Military Specifications MIL C-5541C.

ALODINE 1200S and other ALODINE coating chemicals are listed in the Qualified Products List QPL-81706 as approved materials for method A and B application.

2. Operating Summary:

Chemical:	Bath Preparation per 100 gallons
ALODINE 1200S	6.3 pounds
Operation and Control:	
ALODINE Coating Chemical Titration	6.0 ml
pH	1.3 to 1.8
Temperature	70° to 100° Fahrenheit
Time	15 seconds to 3 minutes

3. The Process:

The complete process for the ALODINE 1200S treatment normally consists of the following steps:

A. Cleaning
B. Water rinsing
C. Deoxidizing (required for heavily oxidized surfaces)
D. Water rinse (required when deoxidizing is used)
E. Treating with the ALODINE 1200S processing solution
F. Water rinsing
G. Post treatment
H. Drying

4. Materials:

ALODINE 1200S
Nitric Acid
RIDOLINE® (cleaner)
DEOXYLYTE® (Post treatment)
Testing Reagents and Apparatus

5. Equipment:

Process tanks and housings should be fabricated from 300 series alloy stainless steel, such as 304L or 316L. The 316L being preferred for maximum tank life. In all cases approved welding techniques must be used.

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 and may reduce the rate of scale buildup in process piping. The nozzles should be fabricated from 316 stainless steel.

Heat exchanger plates should be polished 316 stainless steel. If gas fired burner tubes are used, they should be made of Schedule-80 mild steel pipe or equivalent. 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 Viton™ or Teflon™. EPDM may be used, but its life will be shorter.

Chemical feed pump parts and other elastomers which may come into contact with the concentrated replenishing chemical should be Viton or Teflon. Again, EPDM may be used, but its life will be shorter.

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 under the RIDOLINE trademark and our representative will recommend the proper one for each installation.

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 contamination.

Deoxidizing:
Aluminum with corrosion products or heavy oxide coated surfaces should be treated with a deoxidizer prior to the conversion coating treatment step. The deoxidizing step should follow the water rinse and should itself be followed by a separate water rinse. Our representative can recommend the correct deoxidizer to be used.

7. Treating with the ALODINE 1200S Processing Solution:

Buildup:
Fill the tank about three-fourths full with cold water for each 100 gallons of final solution volume add 6.3 pounds of ALODINE 1200S and circulate until thoroughly mixed. Finally, add sufficient water to bring the solution up to the working level and then heat the operating temperature.

Operation:
Time: 15 seconds to 3 minutes.
Temperature: 70° to 100° Fahrenheit.

Operational Recommendations:
Each alloy reacts with the ALODINE 1200S coating chemical bath to produce a coating that is characteristic of the alloy. For the treating time selected, the bath should produce a light, iridescent golden to tan colored coating on aluminum. If the desired coatings are not obtained, add ALODINE 1200S in 1/4 oz increments (up to a maximum of 3.0 oz/gal) until satisfactory coatings are produced. As the concentration of ALODINE 1200S is increased, the bath will have to be titrated to determine the operating titration. The desired coatings may also be obtained by adjusting the pH.

The initial charge and replenishment data contained herein are normal for most installations; however, our representative may suggest a deviation from this data if indicated by local conditions.

If the ALODINE coating is powdery, the cause may be one or more of the following:

A. The work has been improperly cleaned and/or rinsed.
B. The concentration of the ALODINE coating chemical(s) in the bath is too high.
C. The ALODINE 1200S bath has become contaminated with phosphates, sulfates, chlorides, or some other contaminant (analysis required).
D. The coating time is too long.
E. The bath temperature is too high.
F. The Free Acid of the DEOXYLYTE final rinse is too high (should not exceed 7.0)
G. The pH of the bath is too low for the concentration selected.

If the ALODINE coating is too light, the cause may be one or more of the following:

A. The treating time is too short
B. The concentration of ALODINE 1200S in the bath is too low.
C. The temperature of the bath is outside the specified range.
D. The pH of the bath is outside the specified range.

8. Testing and Control:

Never pipet by mouth, use a pipet filler.

Concentration:
Pipet a 5 ml sample into an iodimetric flask and dilute to approximately 100 ml with water. Add 1/2 teaspoon (approximately 1 g) of Reagent 2 and agitate to dissolve. Add about 10 ml of Reagent Solution 49 in 5 ml increments to the lip of the flask, raising the stopper slightly after each addition to allow the acid to run into the flask. Rinse the lip several times with water and replace the stopper.

After the sample has settled for approximately one minute, titrate with Titrating solution 104 until a straw color is obtained. Do Not rezero the burette. Add several ml of Indicator 10 and continue the titration until the blue-black color disappears. The ml of Titrating Solution 104 used is the bath concentration value in points (ml).

Concentration range: Within ± 1 point (ml) of the value which gives the desired results.

To increase the value 1 point (ml): 1 lb of ALODINE 1200S per 100 gallons.

pH Determination:
A pH determination should be made after each replenishing addition. The optimum pH for this bath is between 1.3 to 1.8.

NOTE: The pH of the ALODINE 1200S bath is controlled by the addition of 1/2 pint of concentrated nitric acid for every 2 to 4 pounds of ALODINE 1200S used. It is recommended that no large bulk additions to nitric acid be made. The nitric acid additions should be made along with the required ALODINE 1200S additions.

In certain instances, the pH of the bath will continue to decrease several hours after an addition of nitric acid (as the solution seeks equilibrium). Accordingly, small adjustments in pH should be made allowing 15 minutes to elapse before subsequent adjustment.

If the amount of nitric acid specified is insufficient to maintain the bath pH, the pH will rise causing a reduction in color intensity of the coating. If this occurs, increase the amount of nitric acid per addition (in small increments to a maximum of 1.5 pints per 2 to 4 pounds of ALODINE 1200S) until the color intensity of the coating is maintained.

9. After Treatment:

Water Rinsing:
After the conversion coating treatment, the work is thoroughly rinsed in cold water. The rinse should be continuously overflowed and the overflow should be regulated with the rate of production so that the main body of the rinse never becomes excessively contaminated.

Post Treatment:
The coated metal, wet from the water rinse, is treated with a dilute post treatment solution. This treatment materially increases the corrosion resistance of the coating and is an essential part of the process. A number of DEOXYLYTE post treatment chemicals are available and the proper one for each installation will be recommended.

Drying:
The treated articles should be dried immediately after the post treatment. Enough heat usually remains from a hot post treatment to cause heavy gauge articles to dry satisfactorily. If the post treatment is not heated or the articles do not dry satisfactorily, an indirect fired drying unit or any other means which will not contaminate the treated surface with fumes, oil, or partially burned gases may be used. If an oven or other heat source is used, the temperature of the metal surface should not be permitted to exceed 150° Fahrenheit to maintain optimum corrosion resistance.

Products with cavities or pockets which trap moisture should be blown dry with clean, compressed air. Moisture spatters should be dried with clean cloths.

Dried, unfinished parts should not be handled. If handling if necessary, plastic or clean (often changed) cotton gloves should be used.

10. Storage Requirements:

ALODINE 1200S is a powdered product and is unaffected by freezing.

11. Waste Disposal Information:

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

The processing bath is acidic and contains chromium and ferricyanide. Waste treatment and neutralization will be required prior to discharge to the sewer. (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 following precaution should be observed during the operation of the ALODINE 1200S coating bath:

Adequate ventilation should be provided for the process area. Operators must not breathe ALODINE coating bath vapors. Open containers in a well ventilated area. Keep containers closed when not in use.

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.

> "Possible cancer hazard based on tests with laboratory animals. Overexposure may create cancer risk."

Refer to the Material Safety Data Sheet for additional information.

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

Code	Quantity	Item
205420	2	Beaker, Plastic, 150-ml
205590	1	Bottle, Plastic, Clear w/Medicine Dropper, 2 oz
205700	1	Buret Assembly, 25-ml Automatic
205852	1	Cylinder, Graduated, 50-ml
205897	2	Flask, Iodimetric, 250-ml
205010	250 ML	Indicator 10 (soluble starch solution)
205953	2*	Pipet, 5-ml, Measuring
205947	1	Pipet Filler
205956	1	Pitcher, Graduated, Plastic
205082	450 GM	Reagent 2 (Potassium Iodide)
205249	2.5 L	Reagent Solution 49 (C.P. HCl)
205980	1	Thermometer, Floating
205104	1.0 L	Titrating Solution 104 (0.1N $Na_2S_2O_3$)
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*Includes one more than actually required, to allow for possible breakage.

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