

000955

TRI-SERVICE CONFERENCE ON CORROSION



21-23 JUNE 1994

SHERATON PLAZA HOTEL
ORLANDO, FLORIDA

PROCEEDINGS

PROPERTY OF:

AMPTIAC LIBRARY

19971028 038

Non Chromated Epoxy Primer for Aerospace Applications

*Mr. Dennis Vorse, Chemist
Mr. Joseph Gausman, Chemist
Lord Corporation
2000 West Grandview Blvd.
Erie, Pennsylvania 16514-0038

Abstract

Aeroglaze® 9740 is a low volatile organic content, chromate free, two-component, solvent based epoxy primer. Its primary use is for aluminum surfaces with a proper surface treatment.

Aeroglaze 9740 contains no photochemically reactive solvents nor any known or suspected carcinogens. Aeroglaze 9740 Part A is made up of a difunctional bisphenol A resin, calcium metasilicate pigment, monoazo pigment, dispersant, suspension additive and solvent. Aeroglaze 9740 Part B consists of a polyamidoamine and solvent.

Aeroglaze 9740 Non-Chromated Epoxy Primer can be applied by brush and roller. It can also be applied by Electrostatic, High Volume Low Pressure (H.V.L.P.) and conventional spray equipment. Aeroglaze 9740 adheres to a broad range of substrates and treatments which will be addressed in the body of the paper.

Introduction

Aeroglaze 9740 can be applied via siphon, high volume low pressure and electrostatic spray. It also can be successfully topcoated with a Mil-C-83286, Mil-C-85285, or any of the various Aeroglaze urethane topcoats.

When Aeroglaze 9740 Part A and Part B are mixed 3 to 1 by volume or 100.00 to 22.35 by weight and allowed to induct for 30 minutes, it will produce a coating that exhibits the characteristics found on Data Table 1.

Aeroglaze 9740 was tested over ¹Parker Amchem Alodine® 1200, ²San Chem® full process, ³Allied-Kelite Chemidize® 727A and Lord Sol-Gel process. The Parker Amchem Alodine® 1200 treatment is a chromate containing system. The San Chem® full process, Allied-Kelite Chemidize® 727A and Lord Sol-Gel process are all chromate-free treatments. These treatments were done on 2024T3 Alclad aluminum. A .9 mil dry film thickness of Aeroglaze 9740 was sprayed on panels over each treatment. Three panels for each treatment were primed and topcoated with 2 dry mils of Mil-C-85285 Gloss White and 3 primed panels for each treatment remained untopcoated.

The previously mentioned panels and treatments were then scribed using a pointed punch at approximately a 1/32" wide scribe line making sure that the Alclad layer was penetrated. After being scribed, the panel edges were waxed and placed in the salt fog running the test as outlined in ASTM B117.

Failure in the salt fog was characterized by any blistering or corrosion 1/8" beyond the scribe line or panel edge.

In addition to the salt fog test, several others were performed:

- 7-day distilled water immersion at ambient conditions, after immersion adhesion test to ASTM D3359
- Dry adhesion to ASTM D3359
- Gloss of Mil-C-85285 over Aeroglaze 9740 on each individual surface treatment.

The results can be found on Data Table 2.

As shown by the results, Aeroglaze 9740 performs without failure after water immersion adhesion testing and dry adhesion. The coatings have excellent gloss over each surface individual treatment. Salt fog resistance over each individual treatment varies but clearly Aeroglaze 9740 performs well over the San Chem® full process, Parker Amchem Alodine® 1200, Lord Sol-Gel process and Allied-Kelite Chemidize® 727A, in that order.

In addition to the screening tests over a variety of different surface treatments, Aeroglaze 9740 was evaluated against Mil-P-23377F Type I Class II specification. A summary of these results can be found in Data

Table 3, which shows that Aeroglaze 9740 meets or exceeds all physical test requirements of Mil-P-23377F Type 1 Class II specifications.

Other substrates that Aeroglaze 9740 adheres to are chromic and sulfuric acid anodized aluminum, sanded fiberglass laminates, sanded epoxy graphite composite, galvanized steel and sand blasted steel.

Some additional evaluations have been performed over sand blasted steel. The steel panels were blasted to a 2 mil profile and MEK solvent rinsed. Aeroglaze 9740 was spray applied at a dry film thickness of 1 mil and 2 mils. Three panels were Mil-C-85285 topcoated at 2 dry mils and three panels remained primed only for each individual primer thickness. Using a pointed punch approximately a 1/32" wide line scribe was made. After being scribed, the panel edges were sealed with wax and subjected to salt fog as outlined in ASTM B117. Results of the testing are summarized in Data Table 4.

This shows that Aeroglaze 9740 performs best at higher primer film thicknesses on blasted steel surfaces topcoated or untopcoated.

Conclusion

Aeroglaze 9740 has a broad range of compatibility with different substrates, treatments and topcoats.

<u>Substrates</u>	<u>Treatments</u>	<u>Topcoats</u>
<ul style="list-style-type: none">• Aluminum• Steel• Composite• Fiberglass	<ul style="list-style-type: none">• Chromate conversion• Non-chromate conversion• Anodized• Zinc phosphate• Galvanized	<ul style="list-style-type: none">• Mil-C-83286• Mil-C-85285• Aeroglaze moisture cure urethanes• Aeroglaze two-component urethanes

In addition, Aeroglaze 9740 can be easily applied by brush, roll electrostatic, conventional and H.V.L.P. spray.

This can benefit the manufacturers and repair facilities of aircraft, space structures, satellites, ground vehicles and ground support equipment.

Data Table 1
 Aeroglaze 9740
 Typical Mixed Properties

Volatile organic content mixed		312 g/liter 2.6 lbs./gal.
Color mixed ready to apply		Bright yellow
Solids content ASTM D2369-87		
	% by weight	75
	% by volume	64
Initial viscosity ASTM D1200, #4 Ford cup at 77°F (25°C)	Seconds	30
4 hour viscosity ASTM D1200, #4 Ford cup at 77°F (25°C)	Seconds	60
8 hour appearance		Highly viscous liquid
24 hour appearance		Gelled solid
Theoretical coverage ft ² /gallon/mil		1,030
Dry to recoat at 77°F and 50% R.H.		5 hours minimum 18 hours maximum
Coating film dry weight theoretical		
	Lbs./ ft ² /mil	.0077
	Gm/ ft ² /mil	3.49
Paint Resistance, 4Ransburg® meter		.2 megohms

Data Table 2

Aeroglaze 9740
Salt Fog Results

	<u>Primed</u>	<u>Primed/Topcoated</u>
Parker Amchem, Alodine® 1200	2,000 hours	1,500 hours
Sanchem, Full Process	Ongoing	3,000 hours
Allied-Kelite, Chemidize® 727A	500 hours	500 hours
Lord, Sol-Gel Process	1,000 hours	1,250 hours

Distilled Water Immersion

	<u>Primed</u>	<u>Primed/Topcoated</u>
Parker Amchem, Alodine® 1200	*Pass	*Pass
Sanchem, Full Process	*Pass	*Pass
Allied-Kelite, Chemidize® 727A	*Pass	*Pass
Lord, Sol-Gel Process	*Pass	*Pass

Dry Adhesion

	<u>Primed</u>	<u>Primed/Topcoated</u>
Parker Amchem, Alodine® 1200	*Pass	*Pass
Sanchem, Full Process	*Pass	*Pass
Allied-Kelite, Chemidize® 727A	*Pass	*Pass
Lord, Sol-Gel Process	*Pass	*Pass

Gloss

	<u>Primed/Topcoated</u>
Parker Amchem, Alodine® 1200	60°/94
Sanchem, Full Process	60°/93
Allied-Kelite, Chemidize® 727A	60°/93
Lord, Sol-Gel Process	60°/92

*Pass constitutes no adhesion loss when tested to ASTM D3359 or in the case of water immersion, no blistering or discoloration besides no adhesion loss.

Data Table 3

Aeroglaze 9740 Non-Chromated Epoxy Primer
Tested to Mil-P-23377F Specification Type I Class II
Primer Aeroglaze 9740 .9 dry mils
Topcoat MIL-C-85285 Gloss White 2.0 dry mils

	<u>Test</u>	<u>Result</u>
3.6.1.	Color	Bright Yellow
3.6.2.	Odor	Pass
3.6.3.	Viscosity, mixed	Pass 31 seconds
3.6.4.	Pot life, 4 hours	Pass 61 seconds
3.6.6.	Storage stability, one year	In progress
3.6.7.	Accelerated stability	Pass
3.7.1.	Surface appearance	Pass
3.7.2.	Dry time	Pass
3.7.3.	Lifting	Pass
3.7.5.	Adhesion	Pass
3.7.6.	Flexibility	Pass 10%
3.7.7.	Strippability	Pass
3.7.8.	Infrared reflectance	N/A
3.8.1.	Water resistance	Pass
3.8.2.1.	Salt spray	Pass
3.8.2.2.	Filiform	Pass
3.8.3.	Solvent resistance	Pass
3.8.4.	Fluid resistance	Pass
3.9.1.	Mixing	Pass
3.9.3.	Application	Pass

Data Table 4

Hours of Successful Completion

- | | |
|---|-------|
| • 1 dry mil of Aeroglaze 9740 | 500 |
| • 1 dry mil of Aeroglaze 9740
2 dry mils of Mil-C-85285 topcoat | 500 |
| • 2 dry mils of Aeroglaze 9740 | 1,000 |
| • 2 dry mils of Aeroglaze 9740
2 dry mils of Mil-C-85285 topcoat | 1,000 |

References:

1. Parker Amchem, a division of Henkel Corporation, 32100 Stephenson Highway, Madison Heights, Michigan 48071.
Phone: 313-583-9300
2. Sanchem, Inc., 1800 South Canal Street, Chicago, Illinois 60616
Phone: 312-733-6100
3. Allied-Kelite, a Witco Company, 2701 Lake Street, Melrose Park, Illinois 60160
Phone: 800-323-9784
4. DeVilbiss-Ransburg, P.O. Box 913T, Toledo, Ohio 43697-0913
Phone: 419-470-2000