



PARALOID™ AU-608S, PARALOID AU-608X, PARALOID AU-608B

Hydroxyl Functional Isocyanate-Reactive Acrylic Resins

Description

PARALOID AU-608S, PARALOID AU-608X, and PARALOID AU-608B are acrylic polyols specifically designed to produce hard, resistant, durable coatings when reacted with aliphatic isocyanates. The exceptional properties of these coatings have led to increased use in such heavy-duty maintenance applications as chemical plant storage tanks and offshore rigs and platforms.

Coatings based on PARALOID AU-608S, AU-608X or AU-608B resin:

- Retain gloss and tint, thereby reducing the need to repaint
- Maintain film integrity when exposed to corrosive chemicals
- Provide long-lasting protection because of abrasion and crack resistance
- Cure at low temperatures

Typical Properties

These properties are typical but do not constitute specifications.

	PARALOID AU-608S	PARALOID AU-608X	PARALOID AU-608B
Non-volatile content, measured at 105°C, %	62	60	62
Solids content, measured at 150°C, %	60	58	60
Solvent	Acetate/ Toluene/ 65/35	Xylene	n-butyl acetate
Viscosity, cPs, 25°C	6,500	6,000	4,500
Density, lb/U.S. gal	8.8	8.5	8.6
Specific gravity, 25°C	1.05	1.02	1.03
Hydroxyl equivalent weight (solids basis)	650	650	650
Hydroxyl equivalent weight (as supplied)	1,080	1,120	1,080
Color APHA	60 max.	60 max.	60 max.
Bulking value, as supplied	0.114 gal/lb	0.118 gal/lb	0.116 gal/lb

Typical PARALOID AU-608-Based Urethane Coating Systems

These products are typically used as high-performance topcoats. They have exceptional gloss and tint retention with very good resistance properties. As topcoats, they can be used over many primers. A typical system consists of an inorganic zinc-rich primer, a high-build epoxy polyamide midcoat with an acrylic urethane coating based on any AU-608 grade being used as the topcoat. In other applications, PARALOID AU-608X is preferred over plastic substrates for its exceptional adhesion and flexibility character. PARALOID AU-608B is the choice if one needs a HAPS-free solvent system. PARALOID AU-608S is the standard within the industrial coatings markets for its balance of properties.

Performance Characteristics

Acrylic urethane coatings based on PARALOID AU-608 resins demonstrate excellent performance properties which allow these coatings to perform well in highly corrosive atmospheres. The following tables demonstrate the performance obtainable with the suggested starting point formulation based on PARALOID AU-608S resin listed in this literature.

**TABLE 1: Typical Appearance/Mechanical Properties*
of Acrylic Urethane Coatings Based on
PARALOID AU-608S or PARALOID AU-608X Resin**

	Formulation #G-608S-10 PARALOID AU-608S	Formulation #G-608X-10 PARALOID AU-608X
Tukon (KHN) Hardness	8.6	11.0
Impact Resistance (in-lb)		
Direct	90	55
Reverse	60	30
1/8" Mandrel Bend	Pass	Pass
Gloss		
20°	88	88
60°	94	93
K Factor	5.6	5.1

*2.5-3.0 mils dry film thickness drawdown on Bonderite 1000; 14-day air dry cure.

**TABLE 2: Chemical Resistance of Acrylic Urethane Coatings
Formulated with PARALOID AU-608S Resin***

Effect of Solvent on Pencil Hardness	PARALOID AU-608S
Initial Pencil Hardness	4H
10% NaOH	
1/2 hour	4H
3 hours	4H
6 hours	4H
12 hours	3H
10% HCl	
1/2 hour	4H
3 hours	4H
6 hours	4H
12 hours	2H
10% Acetic Acid	
1/2 hour	4H
3 hours	4H
6 hours	3H
12 hours	Moderate Blisters
Cleaning Solution¹	
1/2 hour	4H
3 hours	6B+
6 hours	6B+
12 hours	6B+
Toluene	
1/2 hour	B
3 hours	6B+
6 hours	6B+
Acetone	
1/2 hour	6B+
3 hours	6B+
6 hours	6B+

¹EGMBE/water/NH₄OH//50/47/3 weight percent

*2.5-3.0 mils dry film thickness drawdowns on Bonderite 1000;
14-day air dry cure

Exterior Durability of Acrylic Urethane Coatings

The exterior durability of acrylic urethane coatings has been well documented. Exterior durability data on acrylic urethane coatings containing PARALOID AU-608S or PARALOID AU-608X with aliphatic isocyanates is shown below.

TABLE 3: Exterior Durability of PARALOID AU-608S and PARALOID AU-608X

Formulation	Location	60°/20° Gloss		
		Initial	12 Mos.	24 Mos.
5% PVC DEEPTONE BLUES				
AU-608S/Desmodur™ N-75	Florida South 5°	92/90	80/60	76/56
AU-608X/Desmodur N-75	Black Box	92/90	78/53	75/51
AU-608S/Desmodur N-75	Industrial Plant	92/90	84/74	83/69
AU-608X/Desmodur N-75	South Vertical	92/90	84/71	82/68
12% PVC WHITES				
AU-608S/Desmodur N-75	Florida South 5°	94/88	76/36	69/30
AU-608S/Desmodur N-75	Black Box	94/88	79/55	77/42
+1% Tinuvin™ 292 and 1% Tinuvin 328				
AU-608S/Desmodur N-3300		94/88	85/62	81/52

Note: 2.0-2.5 mils dry film thickness drawdowns on Alodine Aluminum

Formulating Suggestions

The two-component formulations given herein are recommended for initial evaluation of PARALOID AU-608S or PARALOID AU-608X. The recommended ratio (solids basis) for PARALOID AU-608S or PARALOID AU-608X/aliphatic isocyanate is 75/25 weight percent. This corresponds to a slight excess of isocyanate resin (1.0/1.05 meq hydroxyl/isocyanate). For best pot life, polyurethane grade solvents are recommended and contamination with water should be avoided. The following formulating suggestions are offered:

Isocyanate

Aliphatic (hexamethylenediisocyanates; HMDI) isocyanates are recommended for best weathering properties. The isocyanates of HMDI, such as Desmodur N-3300 and Luxate HT 2000, impart better appearance durability in PARALOID AU-608S urethane coatings than the biurets of HMDI, such as Desmodur N-75 (see exposure data in Table 3). Either Desmodur N-3300 or Luxate HT 2000 can be substituted *on an equal solids basis* for Desmodur N-75 in the formulations given herein.

Catalyst Suggestions

Coatings using PARALOID AU-608S or PARALOID AU-608X develop properties more rapidly with the use of a tin catalyst such as Metacure™ T-12 (dibutyltin dilaurate). In practice, we recommend levels of 0.01 to 0.05% based on vehicle solids. The lower level appears to be better for chemical resistance properties and extended pot life, while the higher provides very rapid dry times.

Flow Aid

In many formulations, the addition of a flow aid is beneficial. Either SF-1023 Silicone or BYK™ 300 can be tried in this application at a maximum of 0.1% on total resin solids.

UV Absorbers

The addition of UV absorbers (1% each of Tinuvin™ 328 and Tinuvin 292 on total resin solids) can enhance the weathering properties of acrylic urethane coatings. Exposure data is included in Table 3.

Colorants

Most colors can be produced using a sand or media mill grind in PARALOID AU-608S and PARALOID AU-608X. In some instances, it may be preferable to use a grinding medium such as PARALOID DM-55. If predispersed colorants are preferred, we recommend the use of acrylic-based colorants such as the Colortrend™ 844 Series.

Solvents

If faster hardness development is required for PARALOID AU-608S based coatings, we recommend the use of nbutyl acetate as a partial or total replacement for PM acetate in the suggested starting point formulation.

Defoamer

Dehydran™ ARA-7219 has been found to be an effective air release agent at 0.1 to 0.2% (on total paint weight) to minimize foam, particularly in airless spray applications.

**White Acrylic Urethane Enamel Formulation
Based on PARALOID AU-608S Resin
Formulation #G-608S-10**

Materials	Pounds	Gallons
Component 1		
PARALOID AU-608S	101.2	11.5
PM acetate	77.3	9.6
Titanium dioxide (TiPure™ R-960)	238.6	7.2
Sand grind the above for 20 minutes; filter and let down with the following:		
PARALOID AU-608S	352.8	40.6
PM acetate	90.0	11.0
BYK 300	0.4	0.1
Component 1 Total	827.3	80.0
Component 2		
Desmodur N-3300	90.3	9.3
PM acetate	86.0	10.7
Component 2 Total	176.3	20.0
Total Paint	1003.6	100.0

Formulation Constants		Pot Life/Viscosity Progression #4 Ford Cup Viscosity (secs.)	
PVC	16.0%	Initial	59
Volume Solids	43.5%	1 hour	78
Weight Solids	56.7%	3 hours	83
Acrylic/Isocyanate, Wt.%	75/25	6 hours	95
Pigment/Binder Ratio	40/60	ICI Viscosity (poise)	
Viscosity #4 Ford Cup	59 sec.	Initial	2.4
		1 hour	3.0
		3 hours	3.4
		6 hours	4.0

White Acrylic Enamel
Based on PARALOID AU-608X
Formulation #G-608X-10

Materials	Pounds	Gallons
Component 1		
PARALOID AU-608X	100.0	11.83
n-Butyl Acetate (PUG)	100.0	13.70
Titanium dioxide (TiPure R-960)	232.3	7.02
Sand grind above to desired dispersion; filter and let down with the following:		
PARALOID AU-608X	355.8	42.11
n-Butyl Acetate (PUG)	38.7	5.30
BYK 300	0.8	0.10
Component 1 Total	827.6	80.0
Component 2		
Desmodur N-3300	88.5	9.1
n-Butyl Acetate (PUG)	19.5	10.9
Component 2 Total	168.0	20.0
Total Paint	995.6	100.0

Formulation Constants		Pot Life/Viscosity Progression #4 Ford Cup Viscosity (secs.)	
PVC	16.0%	Initial	57
Volume Solids	45.0%	1 hour	79
Weight Solids	59.5%	3 hours	85
Acrylic/Isocyanate, Wt.%	75/25	6 hours	102
Pigment/Binder Ratio	40/60	ICI Viscosity (poise)	
Viscosity #4 Ford Cup	57 sec.	Initial	2.4
		1 hour	3.0
		3 hours	3.5
		6 hours	4.2

Sources of Materials Recommended

Designation	Description	Supplier
PARALOID DM-55	Dispersing Resin	The Dow Chemical Company 2030 Dow Center Midland, MI 48674 989-636-1000
BYK 300	Flow Aid	BYK-Chemie USA 524 South Cherry Street Wallingford, CT 06492 203-265-2086
Metacure T-12	Tin Catalyst	Air Products & Chemicals Inc. P.O. Box 538 Allentown, PA 18105 800-345-3148
Dehydran ARA-7219	Defoamer	Henkel Corporation Process Chemicals Division 350 Mt. Kemble Avenue Morristown, NJ 07960 201-267-1000
Desmodur N-75BA Desmodur N-3300	Aliphatic Isocyanate	Bayer Corporation 100 Bayer Road Pittsburgh, PA 15205 412-777-2000
Colortrend 844 Series	Predispersed Colorants	DeGussa (Creanova) 220 Davidson Avenue Somerset, NJ 08873 732-560-6724
PM Acetate	Solvent	Lyondell Chemical 3801 West Chester Pike Newtown Square, PA 19023 610-359-2000
SF-1023 Silicone	Flow Aid	General Electric Co. Mechanicville Road Waterford, NY 12188 518-237-3330
Tinuvin 328 Tinuvin 292	UV Absorbers	CIBA Specialty Chemicals 540 White Plains Road Tarrytown, NY 10591 800-200-8224
TiPure R-960	Titanium Dioxide	E. I. duPont de Nemours & Co., Inc. Chemicals & Pigments Dept. Wilmington, DE 19898 800-441-9442
Luxate HT 2000	Aliphatic Isocyanate	Lyondell Chemical 3801 West Chester Pike Newtown Square, PA 19023 610-359-2000

Safe Handling Information

Any toxicity hazard associated with these products is likely due to the solvent portion of the product. Thus, it is important to wear protective gloves and clothing when working with these products as well as to avoid overexposure via inhalation. PARALOID AU-608S and AU-608X resins are not expected to be acutely toxic via single oral or dermal exposure. They can be irritating to the skin and moderately irritating to the eyes.

Aliphatic isocyanates, including Desmodur N-75BA, which are recommended for formulation use, are known health hazards if not handled properly. We, therefore, recommend that you contact your suppliers of isocyanates for information regarding appropriate health and safety precautions for these materials prior to using them in your facilities.

Dow Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products.

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