

ANCAMIDE® 2443 Curing Agent**DESCRIPTION**

Ancamide 2443 curing agent is a modified amidoamine designed to be used with liquid epoxy resin. Its extremely low viscosity enables the development of high-performance, 100% solids formulations that can be applied via conventional and airless spray equipment without the use of diluents. Ancamide 2443 is an exceptional formulating tool.

ADVANTAGES

- Very low viscosity
- Excellent adhesion to poorly prepared substrates
- Excellent humidity and corrosion resistance
- Good film appearance and no amine blush
- Long pot life
- Plasticizer-free
- Enables a good balance of properties

APPLICATIONS

- Penetrating sealers for poorly prepared steel and concrete surfaces
- Modifier for polyamides to provide increased solids volume and VOC reduction
- High solids and 100% solids corrosion resistant coating

SHELF LIFE

At least 24 months from the date of manufacture in the original sealed container at ambient temperature. Store away from excessive heat and humidity in tightly closed containers.

STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamide 2443 curing agent.

TYPICAL CURE SCHEDULE

7 days at ambient temperature.

TABLE 1: TYPICAL PROPERTIES

Appearance	Amber liquid
Color¹ (Gardner)	7
Viscosity² @ 77°F (cP)	30
Amine Value³ (mg KOH/g)	530
Specific Gravity⁴ @ 77°F	0.970
Weight per Gallon	8.10
Flash Point⁵ (°F)	>200
Equivalent Wt/{H}	86
Recommended Use Level (phr, EEW=190)	45

TABLE 2: TYPICAL HANDLING PROPERTIES*

Thin Film Set Time⁶ @ 77°F (h)	11.5
Gel Time⁷ (150g mix @ 77°F) (min)	250
Peak Exotherm⁸ (°F)	185
Time to Peak Exotherm (min)	250

* Ancamide 2443 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=190) epoxy resin.

Footnotes:

- (1) ASTM D 1544
- (2) ASTM D 445-83, Brookfield, RVT, Spindle 4
- (3) Perchloric Acid Titration
- (4) ASTM D 1475-85
- (5) Seta Flash Closed Cup
- (6) BK-Recorder, 6 mil wet film thickness
- (7) ASTM D 2471-71
- (8) ASTM D 3418-82

SUPPLEMENTARY INFORMATION

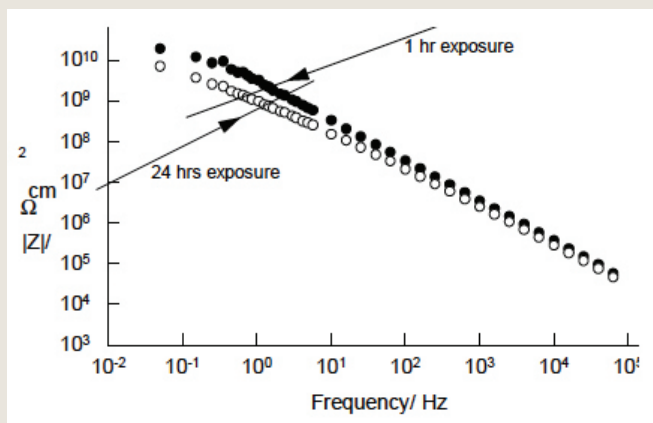
Ancamide 2443 curing agent is an ultra-low-viscosity, modified amidoamine containing no plasticizers or solvents, thus enabling the formulator to develop 100% solids coatings which can be applied via brush, roller or with conventional spray equipment. When used with liquid epoxy resins, the low-mix viscosity of the system allows Ancamide 2443 curing agent to be used as a penetrating sealer or as a direct-to-metal primer without the addition of cosolvents. The product has good blush resistance and provides excellent adhesion to poorly prepared surfaces. It is ideal for sealing in rusty steel or for filling voids in concrete surfaces. Ancamide 2443 curing agent also exhibits a long pot life and offers an extensive recoat window.

STARTING POINT FORMULATIONS

Ancamide 2443 curing agent can be used to develop high-performance, 100% solids coatings. Formulation 2443S1 is a starting point formulation developed to demonstrate the excellent adhesive properties of the curing agent when applied to both concrete and rusted steel substrates. Formulation 2443S1 contains both Epodil® L (Epodil LV5 is a new alternative offered by Evonik) and Epodil 759 diluents in order to maintain the low application viscosity (180 cP). The addition of Ancamine® K54 curing agent can also be used to improve the set time of Ancamide 2443 formulations. Typical usage levels for Ancamine K54 curing agent are in the range 2.5-5.0% by weight (based on the Ancamide 2443 curing agent level). Additionally, additives such as FC430 (3M) or Byk 354 can be used to improve flow and surface appearance.

Formulation 2443P1 is a starting point formulation developed for use as a 100% solids, direct-to-metal primer. The formulation has a low initial mix viscosity (1600 cps) and a pot life of 2.25 hours. Preliminary evaluations of Formulation 2443P1 have been conducted using electrochemical impedance spectroscopy (EIS), see Figure 1.

FIGURE 1: ANCAMIDE 2443P1—EIS ANALYSIS



Results obtained show coatings based on Formulation 2443P1 have the potential to provide excellent corrosion resistance. The pore resistance of coatings applied to grit blasted steel (2.5 mil, DFT) was in excess of 1010 ohms following 24 hours exposure to the electrolyte solution (1M NaCl). This value is comparable to results obtained for many solvent-borne polyamide coatings used in industrial maintenance primers. The test primers also exhibited excellent humidity resistance. After 1000 hours of continuous exposure in the Cleveland humidity cabinet, the test panels remained free from field blisters and other surface defects.

Formulation 2443 ACP2 is a starting point formulation developed as a high-solids anti-corrosive primer. Evaluations of this primer were completed using salt spray (ASTM B117) and prohesion (ASTM G85-A5) on Bondrite 952 panels with 3-4 mil DFT with very successful results, shown below in Tables 3 and 4.

TABLE 3: SALT SPRAY RESULTS

Salt Fog	Blisters*	Field*	Scribe**
500 hours	None	10	10
2000 hours	Few	9	9

TABLE 4: PROHESION RESULTS

Cyclic Prohesion	Blisters
500 hours	None
2000 hours	None

* ASTM D 714
** ASTM D 1654

ADHESION TESTS

A severely rusted bridge girder was used as the source for steel test panels. Prior to application of Formulation 2443S1, test samples of approximately 8" x 5" in size were cut and power cleaned using cut brushes. The clear sealer was applied to the rusty steel via brush and allowed to cure at room temperature for 72 hours. A stainless steel epoxy finish (Epon 1001/polyamide curing agent) was applied over the sealer at a dry film thickness of 2.0-2.5 mils. Following a 10-day cure schedule (72°F/50% RH), aluminum dollies were fixed to the top coat using an epoxy adhesive. After a further 3 days cure, the dollies were pulled using an Elcometer test apparatus, in accordance with ASTM methodology (ASTM D 4541). Resultant bond strengths were in excess of 750 psi, indicating that the mode of failure occurs within the rusted layers of the steel. No problems were observed relating to intercoat adhesion failure between sealer and stainless steel finish, and no breakdowns were seen in the sealer coat itself.

Formulation 2443S1 was also applied over poorly prepared concrete. Results of these adhesion tests indicate that failure occurs at the concrete substrate. Bond strength values of 490 psi were recorded.

Figures 2 and 3 show the results summarized in Tables 3 and 4.

FIGURE 2: SALT FOG RESULTS

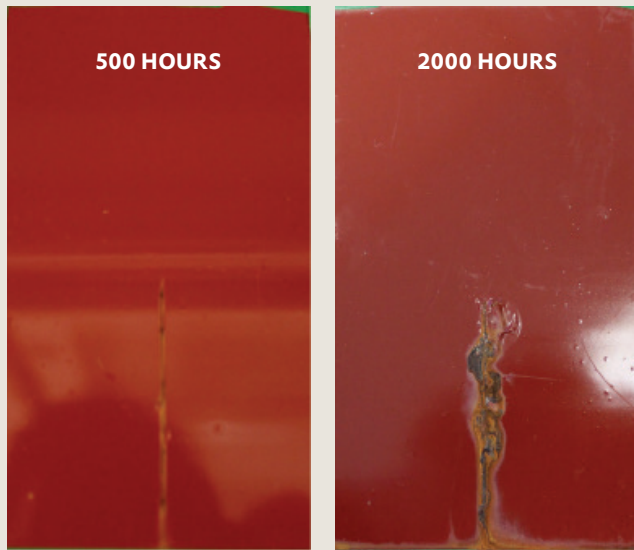
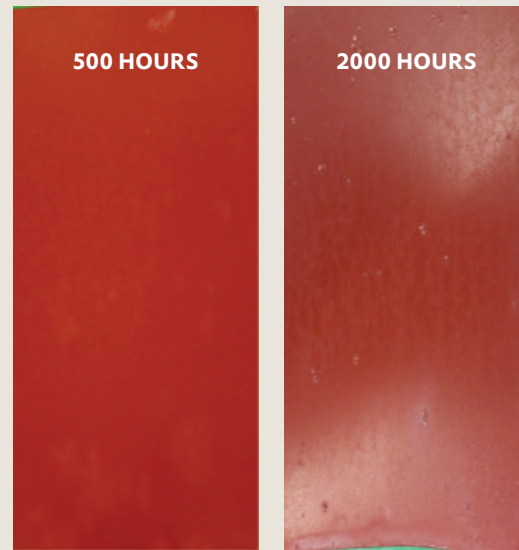


FIGURE 3: CYCLIC PROHESSION RESULTS



ANCAMIDE 2443 CURING AGENT STARTING POINT FORMULATIONS

**TABLE 3: FORMULATION 2443S1—
PENETRATING SEALER (CLEAR COAT)**

A Side	Pounds	Gallons	Supplier
Ancamide 2443	229.7	29.00	Evonik
A-1100 (silane)	8.1	1.02	Witco
Epodil L*	26.1	3.00	Evonik
Ancamine K54	8.1	1.00	Evonik
Total (A side)	272.0	34.02	
B Side	Pounds	Gallons	Supplier
Liquid Epoxy Resin	426.8	44.00	Dow, Resolution
Epodil 759	126.0	17.00	Evonik
Epodil L*	58.0	6.67	Evonik
Byk 307	2.1	0.23	Byk Chemie
Total (B side)	612.9	67.90	
Typical Properties			
Vol Solids (%)	100.0		
Mix Ratio (A:B,vol)	1:2		
PVC (%)	0.0		
VOC (lb/gal)	0.0		
Pot Life (h)	5.0		
Initial Viscosity (cP)	180.0		
Adhesion (dolly pull off)			
Rusted Steel (psi)	790		
Concrete (psi)	490		

**TABLE 4: FORMULATION 2443P1—
100% SOLIDS—DIRECT TO METAL PRIMER**

A Side	Pounds	Gallons	Supplier
Ancamide 2443	154.9	19.55	Evonik
Cabosil TS720**	9.2	0.58	Cabot
Wollastocoat 10ES	200.0	8.26	NYCO
Zeospheres 400	100.0	5.45	3M
Halox SZP-391	50.0	1.99	Halox
Red Iron Oxide J-3106	50.0	1.20	Bayer
Byk 354	0.6	0.07	Byk Chemie
Epodil L*	21.3	2.44	Evonik
Total (A side)	586.0	39.57	
B Side	Pounds	Gallons	Supplier
Liquid Epoxy Resin	309.3	31.89	Dow, Resolution
Epodil 759	57.0	7.69	Evonik
Total (B side)	366.3	39.58	
Typical Properties			
Vol Solids (%)	99.9	Wt per gallon (lb/gal)	12.03
Mix Ratio (A:B,vol)	1:1		
PVC (%)	22.1		
VOC (lb/gal)	0.03		
Pot Life (h)	2.25		
Initial Viscosity (cP)	1600		
Dry to touch (h)	>24		

* Epodil LV5 is now offered by Evonik instead of Epodil L.
** Evonik's Aerosil R202 may also be used.

ANCAMIDE® 2443 Curing Agent**TABLE 5: FORMULATION 2443 ACP2 — HIGH SOLIDS ANTI-CORROSIVE PRIMER**

Raw Materials — A Side	Pounds	Gallons	Supplier
Liquid Epoxy resin , EEW 188	309.3	31.89	Olin Corporation
Epodil® 759	57.0	7.69	Evonik
TOTAL	366.3	39.58	
Raw Materials — B Side	Pounds	Gallons	Supplier
Ancamide® 2443	155	19.55	Evonik
Aerosil® 200	9.2	0.58	Evonik
Wollastocoat 10 ES	200	8.26	Nyco
Zeeospheres G 400	100	5.45	Zeeospheres
Halox SZP-391	50	2.0	ICL
Red Iron Oxide	50	1.20	Lanxess
BYK 354	0.6	0.07	Byk Chemie
Epodil® LV-5	21.3	2.44	Evonik
TOTAL	586	39.55	

Formulation properties	Value
VOC (lb/gal)	0.03
Volume Solids (%)	99.9
Density (lb/gal)	12.03
Mix Ratio	1:1
PVC (%)	22.1
Mixed Viscosity (cP)	1600

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