Product information

ANCAMIDE® 801

Curing Agent

DESCRIPTION

Ancamide 801 curing agent is a highperformance polyamide designed for use with standard epoxy resins. It offers a costeffective route to high-solids/low-VOC, ambient-cure coatings. Ancamide 801 curing agent is plasticizer-free. Special features of Ancamide 801 systems include relatively low viscosity, fast dry times, excellent barrier properties and high-gloss films.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Amber Liquid		
Colour	6	Gardner	ASTM D 1544-80
Viscosity @ 25°C	14,000	cP	ASTM D 455-83, Brookfield RV, Spindle 27
Amine Value	348	mg KOH/g	Perchloric Acid Titration
Specific Gravity @ 25°C	0.97		ASTM D 1475-85
Flash Point	>392	°C	Seta flash closed cup
Equivalent Wt/{H}	145		
Recommended use Level	76	phr	(EEW=190)

ADVANTAGES

- Low viscosity versus standard polyamides
- Rapid dry times
- Plasticizer and benzyl alcohol-free
- Excellent corrosion resistance
- Excellent wet adhesion
- Good flexibility
- Supplied at 100% solids
- DOT noncorrosive

APPLICATIONS

- High-solids marine, OEM and industrial maintenance coatings
- Adhesives and sealants
- Concrete primers and paints
- Encapsulation and castings
- Laminates

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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 801 curing agent.

TYPICAL CURE SCHEDULE

2-7 days at ambient temperature.
Films can be force-dried or baked to accelerate cure.

TYPICAL HANDLING PROPERTIES *

Property	Value	Unit	Method
Mixed Viscosity	15,600	cP	ASTM D 455-83, Brookfield RV, Spindle 52
Gel Time (150g mix @ 77°F)	83	min	Techne GT-4 gelation timer
Thin Film Set Time @ 77°F	3.9	h	
Peak Exotherm (100 g mass)	170	°F	ASTM D 2471-71

TYPICAL PERFORMANCE PROPERTIES

(7 days cure @ 77°F)	Value	Unit	Method
Glass Transition Temp	111	°F	ASTM D 3418-82
Compressive Strength @ Yield	15,260	psi	ASTM D 2240-86
Compressive Modulus	456	thousand psi	ASTM D 2240-86
Tensile Strength	7,248	psi	ASTM D 638-86
Tensile Modulus	312	thousand psi	ASTM D 638-86
Tensile Elongation at break	4.1	%	ASTM D 638-86
Flexural Strength	10,441	psi	ASTM D 790-86
Flexural Modulus	356	thousand psi	ASTM D 790-86
Hardness	76	Shore D	ASTM D 2240-86

* Ancamide 801 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=190) epoxy resin.

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SUPPLEMENTARY DATA

MODEL CLEARCOAT FORMULATIONS

I. VOC AND HANDLING CHARACTERISTICS: Ancamide 801 curing agent is a cost-effective route to high-solids/low-VOC coatings. Ancamide 801 allows the formulator to balance effective VOC reduction with formulating latitude in order to achieve cost reductions in paint formulations.

Figure 1 shows model clearcoatsa with Ancamide 801 curing agent characterized as having greater than 80% solids by weight and less than 1.7 lb/gallon VOC. This is 20% lower than the VOC attainable using similar equivalent weight polyamides.

FIGURE 1: ANCAMIDE 801 CURING AGENT VOC AND WEIGHT SOLIDS COMPARISON

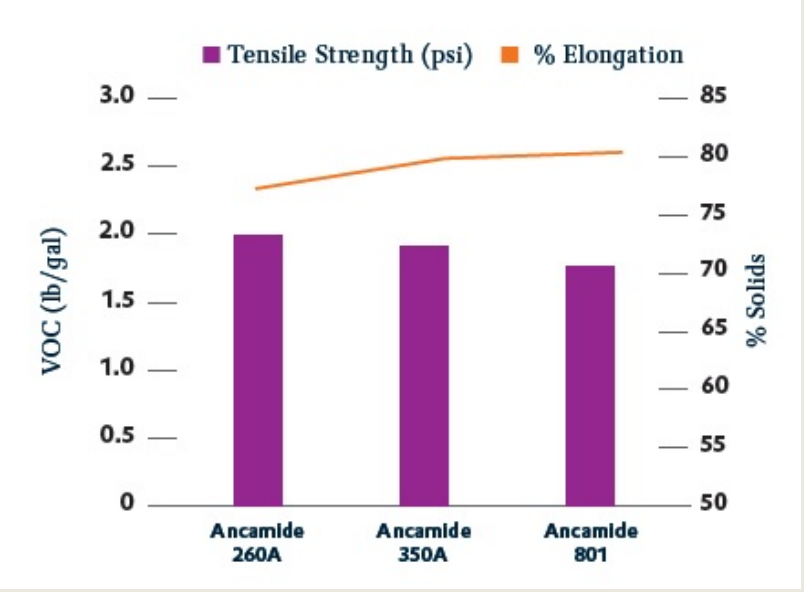
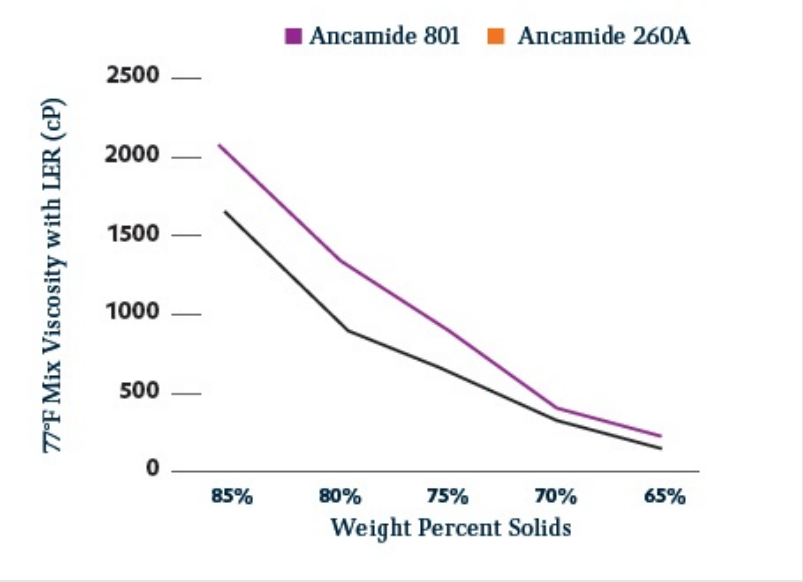


Figure 2 illustrates the viscosity and VOC reduction advantages attainable with Ancamide 801 formulations. For example, at 1.8 lb/gallon VOC, Ancamide 801 curing Agent provides a 41% viscosity reduction versus Ancamide 260A curing agent. Similarly, at 1000 cP mix viscosity, the Ancamide 801 curing agent system offers a 14% VOC reduction versus Ancamide 260A curing agent. This mix viscosity reduction provides the formulator with an opportunity to reduce system cost.

Table 4 illustrates the handling characteristics of model clearcoat polyamide systems. Contrary to many approaches to viscosity and VOC reduction, Ancamide 801 curing agent has a relatively high amine hydrogen equivalent weight (AHEW) of 145. This high equivalent weight allows Ancamide 801 curing agent to be easily formulated into convenient package ratios. This combination of high equivalent weight and low viscosity allows for use of higher equivalent weight resin systems in high-solids coatings.

FIGURE 2: VISCOSITY REDUCTION CURVES HIGH EQUIVALENT WEIGHT POLYAMIDES



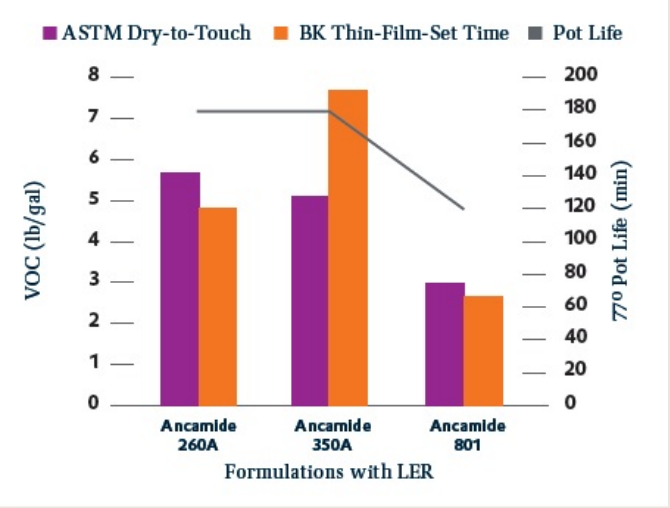
Figures 1 and 2 are based on clearcoat formulations with LER; Figure 1 is normalized to 300 cP mix viscosity.

TABLE 4: COMPARATIVE HANDLING CHARACTERISTICS OF POLYAMIDE-CURED COATING FORMULATIONS

Curing Agent	Curing Agent AHEW	Curing Agent Viscosity (cP)	Mixed Viscosity with LER (cP)	Model Clearcoat VOCb (lb/gallon)
Ancamide 260A	120	40,000	28,400	1.9
Ancamide 350A	100	11,000	18,600	1.7
Ancamide 801	145	14,000	15,600	1.6

DRY TIMES FOR CLEAR COATING FORMULATIONS: As shown in Figure 3 and Table 5, Ancamide 801 curing Agent imparts dry times much faster than conventional polyamides. In model clearcoats, Ancamide 801-cured formulations exhibit greater than 50% reduction (improvement) in dry time compared with conventional polyamides, as measured by ASTM[d] dry-to-touch times and BK[e] thin-film-set times.
Formulated coatings using Ancamide 801 curing agent can exhibit >8 hours of pot life.

FIGURE 3: DRY TIME / POT LIFE COMPARISON FOR MODEL CLEARCOATS



FLEXIBILITY: In contrast to alternative approaches to VOC reduction, Ancamide 801 curing agent imparts excellent flexibility. As shown in Figure 4 and Table 6, Ancamide 801 curing agent clearcoat formulations give forward and reverse impact resistance greater than 160 in-lb. This Impact resistance is better than other high-solids and conventional polyamide-cured clearcoats.

FIGURE 4: IMPACT RESISTANCE OF MODEL CLEARCOATS – 14-DAY CURE

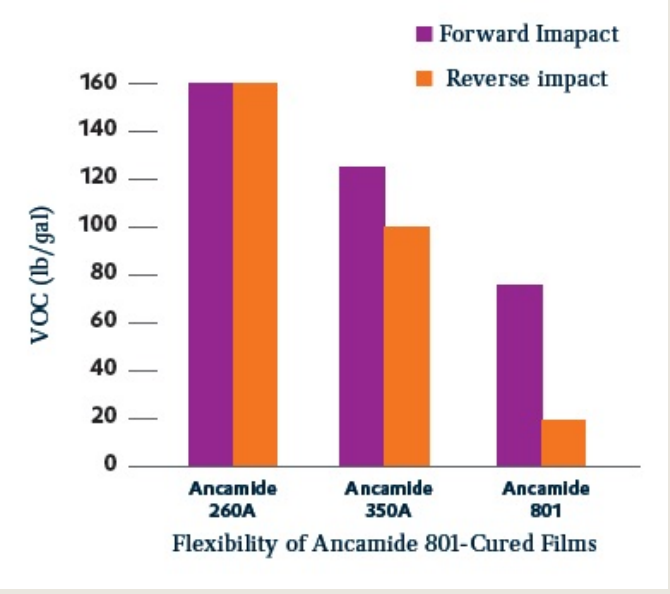


TABLE 5: DRY TIMES FOR POLYAMIDE CLEARCOAT FORMULATIONS

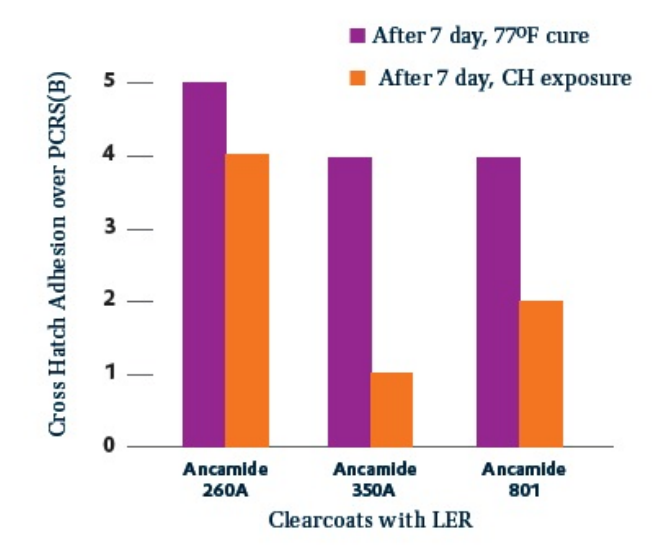
	Dry Times (hours) after 60 minute Induction[f]			
Curing Agent (Model Clearcoat)	**ASTM[d] Set-to-Touch**	**ASTM[d] Dry-to-Touch**	**ASTM[d] Dry Hard**	**BK Thin-Film-Set Time[e]**
Ancamide 260A	2.8	5.7	>8.0	4.8
Ancamide 350A	2.5	5.2	>8.0	7.5
Ancamide 801	2.3	3.0	5.0	2.6

TABLE 6: DRY TIMES FOR POLYAMIDE CLEARCOAT FORMULATIONS

	7 Days Cure at 77°F 50% Relative Humidity			14 Days Cure at 77°F 50% Relative Humidity	
Curing Agent (Model Clearcoat)	**Forward Impact Resistance[g] in-lb**	**Reverse Impact Resistance[g] in-lb**	**Mandrel Bend[g]**	**Forward Impact Resistance[g] in-lb**	**Reverse Impact Resistance[g] in-lb**
Ancamide 260A	2.8	5.7	>8.0	2.8	5.7
Ancamide 350A	2.5	5.2	>8.0	2.5	5.2
Ancamide 801	2.3	3.0	5.0	2.3	3.0

ADHESION CHARACTERISTICS: Ancamide 801 curing agent exhibits improved wet adhesion[h] versus higher solids and standard polyamide systems. Model clearcoat characterizations in Figure 5 demonstrate Ancamide 801 curing agent's excellent adhesion – 4B crosshatch adhesion to phosphate-treated cold rolled steel (PCRS) aft e r a 7-day ambient cure and 104°F Cleveland Humidity Cabinet exposure[e].

FIGURE 5: CROSS HATCH ADHESION FOR MODEL CLEARCOATS

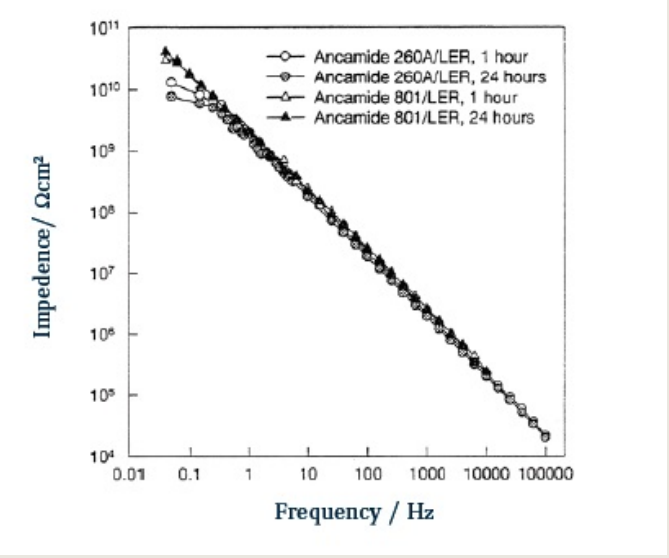


MODEL CLEARCOAT BARRIER PROPERTIES AS QUANTIFIED BY EIS: Electrochemical Impedance Spectroscopy (EIS) is a coatings characterization technique used to quantify barrier properties of protective coatings. Changes in the protective ability of coatings are measured as changes in the impedance response with immersion time in 1M NaCl or other electrolyte solution.

The EIS spectrum for a coating on a metal substrate is a representation of total impedance as a function of frequency. Increases in coating capacitance, refl ected as a downward shift in the high-frequency region of the impedance curve, are caused by water absorption. Decreases in the Coating resistance, indicated by reduction in the low-frequency impedance plateau, can indicate formation of ionically conductive pathways. Water absorption and the loss of
resistance to ionic penetration typically lead to the initiation of corrosion. Ideally, high-performance barrier coatings will not exhibit signifi cant changes in EIS response between 1 and 24 hours of immersion in 1M NaCl.

Ancamide 801-cured model clearcoats exhibit excellent barrier properties as characterized by EIS. Figure 6 illustrates that the Ancamide 801 curing agent-based clearcoats exhibit hydrophobicity and resistance to ionic penetration that is characteristic of high-performance epoxy barrier coatings. The Ancamide 801 clearcoats exhibit an EIS Response comparable to conventional polyamide clearcoats.

FIGURE 6: EIS FOR ANCAMIDE 801 VERSUS STANDARD POLYAMIDE



GENERAL FORMULATING GUIDELINES

RESIN SELECTION: The low viscosity and high equivalent weight of Ancamide 801 curing agent allow for signifi cant latitude in resin selection. For example, 36.8 % PVC, VOCcompliant coatings can be attained using 425 EEW blends of solid and liquid epoxy resin. The cure speed of Ancamide 801-based formulations allows rapid dry times to be attained using 190 EEW liquid epoxy resin. Finally, the fl exibility and excellent corrosion resistance of Ancamide 801-based coatings further enhances the properties attainable using novel, backbone modifi ed epoxy resins such as Epon 874-CX-90.

STOICHIOMETRY: 1:1 stoichiometry is recommended for best results.

SOLVENT SELECTION: For maximum water and corrosion resistance, the solvent system should be predominantly hydrophobic. To compatibilize the binder components, it is oft en useful to incorporate modest levels of less hydrophobic solvents such as alcohols and glycol ethers. However, at unacceptably high levels, alcohols and glycol ethers have been shown to reduce resistance to all moisturerelated exposures. In this regard, glycol ethers impart more sensitivity than an equivalent weight percent of alcohol. Ketones, including MPK and MAK, have shown good performance, and can be used to increase pot life with little effect on dry speed. For aminecured epoxy systems, ester solvents, which react with aminebased curatives, should be packaged with the epoxy resin.

ACCELERATION: Ancamide 801-based coatings can be effectively accelerated with Ancamine® K54 (2-5% based on resin solids) accelerator. When accelerating with Ancamine K54, it is advisable to reduce the use level of Ancamide 801 curing agent by 5-15%.

PIGMENT SELECTION: Extender/filler pigments should be of relatively low oil absorption and free of soluble salts. Recommended extender pigments include wollastonites, low oil absorption magnesium silicates (talcs), barium sulfate and synthetic fillers such as Zeeospheres. Prime pigments such as red iron oxide and titanium dioxide should be limited only by their oil absorption and the level required to achieve the desired hiding. Use of anticorrosive pigments should be based primarily on their effectiveness and stability. Heucophos ZPA and Phosguard J0815 are anticorrosive pigments that have demonstrated effectiveness in Ancamide 801-based systems.

PIGMENT DISPERSANTS: Pigment dispersants are recommended when dispersing pigments into the epoxy resin. Pigment dispersants found to be effective with Ancamide 801 curing agent include: Nuosperse 657, Disperbyk 101 and Anti-Terra U. The recommended use level is 1.0 to 2.0% based on total pigment weight.

THIXOTROPES: Optimum component stability and sag resistance has been achieved with the use of fumed Silicas such as Aerosil® R202 fumed silica or Cab-O-Sil TS-720 at a level of 0.5 to 1.0% based on total formula weight. While organo-clays have been shown to be excellent for Pigment stability, they do not produce the desired application rheology needed for sag control in high-solids Ancamide 801-based formulations.

AIR RELEASE AGENTS: The use of an air release agent may be necessary in the development of Ancamide 801-based formulations for airless spray applications. Should such an additive be necessary, silicone-free additives such as Byk A-530 or A-500 have been found to be effective at a level of 0.1 to 0.3% based on total formula weight.

STARTING POINT FORMULATIONS

Formulations 1-4 show starting point formulations for two anticorrosive primers, a performance mid-coat and a gray semi-gloss enamel developed utilizing Ancamide 801 curing agent. Handling and performance properties follow each of the formulations.

FORMULATION 1: ANTICORROSIVE PRIMER ANCAMIDE 801 CURING AGENT WITH 425 EEW EPOXY RESIN BLEND

Part A	**Pounds**	**Gallons**
Solid Epoxy Resin Solution*	266.0	28.98
Disperbyk 101 Dispersant	6.0	0.80
Aromatic 100	18.6	2.55
MPK	46.7	6.92
Cab-O-Sil TS-720	9.0	0.60
Red Iron Oxide	69.4	1.70
Halox SZP-391	69.5	2.77
Zeeosphere 400	189.0	10.33
Barium Sulfate	223.7	6.10
Nicron 402	56.2	2.41
Letdown		
Liquid Epoxy Resin	66.5	6.86
Isopropanol	14	1.93
MPK	54.3	8.06
Part A TOTAL	**1089.5**	**80.0**
Part B		
Ancamide 801	109.4	13.59
High Flash Naphtha	14.8	2.04
Isopropanol	28.6	4.37
Part B TOTAL	**152.8**	**20.0**
Formulation TOTAL	**1242.3**	**100.0**
Thinner	**Weight %**	**Volume %**
MPK	56.9	57.9
High Flash Naphtha	26.9	25.2
Isopropanol	16.2	16.9

* Solid Epoxy Resin Solution is D.E.R. 671 PM75 or Epon 1001 H75 type
** Aerosil R202 may also be used

FORMULATION 1–ANTICORROSIVE PRIMER WITH 425 EEW EPOXY RESIN BLEND

APPLICATION: FAs prepared, this primer has a 1000 cP mix viscosity but can be let down as necessary using thinner. For example, 450 cP mix viscosity can be attained combining 13.4 parts A+B : 1 part thinner (by volume). For airless spray applications, solvent can be withheld to achieve the higher viscosity necessary for acceptable spray atomization. This produces a coating with a VOC of ~2.10 lb/gallon.

Formulation Attributes		Formulation Attributes at 450 cP Mix Viscosity	
Weight Solids (%)	80.2	Weight Solids (%)	77.0
Volume Solids (%)	65.0	Volume Solids (%)	60.5
PVC (%)	36.8		
VOC (lb/gallon)	2.47	VOC (lb/gallon)	2.76
VOC (g/L)	296	VOC (g/L)	330
Mix Ratio	4:1		

TABLE 7 – FORMULATION 1: ANTICORROSIVE PRIMER: CHEMICAL RESISTANCE[N]

Reagent*	Effect on Ancamide 801 / 425 EEW Resin Primer
5% Acetic Acid	No Effect
10% Hydrochloric Acid	No Effect
10% Sulfuric Acid	Blanching
10% Nitric Acid	Slight Swelling
10% Sodium Hydroxide	No Effect
10% Ammonium Hydroxide	No Effect
De-Ionized Water	No Effect
Unleaded Gasoline	Loss of Gloss
Skydrol LD-4	Loss of Gloss
Brake Fluid	Loss of Gloss

* 24 hour spot test

TABLE 8 – FORMULATION 1: COMPARATIVE PROPERTIES

Property	Ancamide 801/ 425 EEW Resin Blend	Ancamide 260A/ 425 EEW Resin Blend
Mixed Viscosity[j] (cP)	450.0	450.0
VOC (lb/gallon)	2.76	2.88
Salt Fog[k] (scribe/field)	9/10 @ 2000 hr	9/10 @ 2000 hr
Cost Per Mil Sq Ft (Cents)	1.000	0.996

* Ancamide 260A performance is included for comparison. The Ancamide 260A/425 EEW Resin Blend formulation is directly analogous to the Ancamide 801/425 EEW Resin Blend formulations given in Formulation 1.

FORMULATION 2: ANTICORROSIVE PRIMER – ANCAMIDE 801 CURING AGENT WITH 190 EEW LIQUID EPOXY RESIN

Part A	Pounds	Gallons
Liquid Epoxy Resin**	250.0	25.77
MPA-1078	4.0	0.054
J-3175	60.0	1.56
Wollastocoat 10AS	200.0	8.26
Barytes	360.0	10.06
Aromatic	128.5	17.67
Part A TOTAL	**1002.5**	**63.87**
Part B		
Ancamide 801	100.0	12.43
MPA-1078	2.0	0.27
Byk 325	2.0	0.21
Zeospheres 400	80.0	4.37
SuperJet Lampblack	2.0	0.13
LVT 325	100.0	4.29
Phosguard J-0815	180.0	6.75
Ancamide 801	92.8	11.53
n-Butanol	121.0	17.93
Acetone	40.0	5.97
Part B TOTAL	**719.8**	**63.92**
Formulation TOTAL	**1722.3**	**127.8**

** Liquid Epoxy Resin is D.E.R. 331 or Epon 828 type

FORMULATION 2 ANTICORROSIVE PRIMER WITH 190 EEW LIQUID EPOXY RESIN

Formulation Attributes			
Weight Solids (%)	83.0	Weight/Gallon Part A	15.70
Volume Solids (%)	67.0	Weight/Gallon Part B	11.26
PVC (%)	41.0	Weight per Gallon	13.48
CPVC (%)	58.0	Mix Ratio	1:1
VOC (lb/gallon)	2.09		
VOC (g/L)	250		

TABLE 8–FORMULATION 2: ANTICORROSIVE PRIMER PROPERTIES

Property	Ancamide 801/ 425 EEW Resin Blend	Ancamide 260A/ 425 EEW Resin Blend
Pot Life[c] (hr)	>12	3
Mixed Viscosity[i] (cP)	450	1000
VOC (lb/gallon)	2.76	2.09
Set-to-Touch[d](min)	29	90
Dry-to-Touch[d](hr)	5.5	ND
Hard Dry[d](hr)	7.5	13
Sag Resistance (mils)	13	8
Pencil Hardness[j] (1-day/7-day Cure)	HB/2H	-/3H
20°/60° Specular Gloss @ 14-day cure	11/56	-/20
Cross Hatch Adhesion[h]	5B	5B
Salt Fog[k] (2000 hr; Scribe/Field)	9/10	7/10
Cleveland Humidity[m] (2000 hr; Field)	10	8F
Direct Impact Resistance[g] (in-lb)	25	40
Reverse Impact Resistance[g] (in-lb)	<5	4

TABLE 9 – FORMULATION 2: COMPARATIVE PROPERTIES

Property	Ancamide 801 / LER	Ancamide 260A / LER
Mixed Viscosity[i] (cP)	1000	1000
VOC (lb/gallon)	2.09	1.84
Salt Fog[k] (scribe/field)	7/10 @ 2000 hr	7/10 @ 2000 hr
Cost Per Mil Sq Ft (Cents)	1.456	1.486

* The Ancamide 260A/LER formulation is similar to the Ancamide 801/LER formulation given in Formulation 2; however, this Ancamide 260A/LER formulation is a 36.8 % PVC, 81.7 weight % solids formulation using the same anticorrosive and extender pigments, the same additive package, and a comparable solvent system.

FORMULATION 3: PERFORMANCE MID-COAT ANCAMIDE 801 CURING AGENT WITH 425 EEW EPOXY RESIN BLEND

Part A	Pounds	Gallons
Solid Epoxy Resin Solution*	253.9	27.59
Disperbyk 101 Dispersant	4.5	0.57
High Flash Naphtha	21.5	2.96
MPK	40.3	6.00
Cab-O-Sil TS-720**	9.0	0.60
TiPure R-900	178.0	5.35
Wollastocoat 10ES	183.0	7.56
Barium Sulfate	291.5	7.95
Letdown		
Liquid Epoxy Resin***	63.5	6.54
Isopropanol	34.1	5.22
MPK	64.9	9.66
Part A TOTAL	**1144.2**	**80.0**
Part B		
Ancamide 801	104.0	12.92
High Flash Naphtha	35.2	4.84
MPK	15.1	2.24
Part B TOTAL	**154.3**	**20.0**
Formulation TOTAL	**1298.5**	**100.0**
Thinner	**Weight %**	**Volume %**
MPK	56.9	57.9
Aromatic 100	26.9	25.2
Isopropanol	16.2	16.9

* Solid Epoxy Resin Solution is D.E.R. 671 PM75 or Epon 1001 H75 type
** Aerosil R202 may also be used
*** Liquid Epoxy Resin is D.E.R. 331 or Epon 828 type

FORMULATION 3: PERFORMANCE MID-COAT

APPLICATION: As prepared, this primer has an initial mix viscosity of 1000 cP. The formulation can be let down to desired mapplication viscosity using thinner. For example, 450 cP mix viscosity can be attained combining 11.0 parts A+B:1 part thinner (by volume).

Formulation Attributes	
Weight Solids (%)	78.7
Volume Solids (%)	60.5
PVC (%)	35.5
VOC (lb/gallon)	2.77
VOC (g/L)	332
Mix Ratio	1:1

TABLE 10 – FORMULATION 3: MID-COAT PROPERTIES

Property	Ancamide 801 Mid-Coat
Pot Life[c] (hr)	>12
Mixed Viscosity[i] (cP)	1000
VOC at 1000 cP (lb/gallon)	2.77
VOC at 450 cP (lb/gallon)	3.10
Set-to-Touch[d](min)	33
Dry-to-Touch[d](hr)	4.25
Hard Dry[d](hr)	6.5
Pencil Hardness[j] (1-day/7-day Cure)	F/H
Specular Gloss (60°/20° ; 14-day cure)	15/65
Sag Resistance (mils)	13+
Cross Hatch Adhesion[h]	5B
Direct Impact Resistance[g] (in-lb)	30
Reverse Impact Resistance[g] (in-lb)	<5
Salt Fog[k] (500 hr; Scribe/Field) (Directly on GBS)	8/10
Cleveland Humidity[m] (500 hr; Field) (Directly on GBS)	10
Cost per Mil Sq Ft (cents)	0.996

TABLE 11 – FORMULATION 3: CHEMICAL RESISTANCE[N]

Reagent*	Effect on Ancamide 801 / 425 EEW Resin Mid-Coat
5% Acetic Acid	Slight Stain
10% Hydrochloric Acid	Slight Stain
10% Sulfuric Acid	No Effect
10% Nitric Acid	No Effect
10% Sodium Hydroxide	No Effect
10% Ammonium Hydroxide	No Effect
De-Ionized Water	No Effect
Unleaded Gasoline	Loss of Gloss
Skydrol LD-4	Loss of Gloss
Brake Fluid	Loss of Gloss

* 24 hour spot test

FORMULATION 4: GRAY SEMIGLOSS FINISH COAT ANCAMIDE 801

Part A	Pounds	Gallons
Liquid Epoxy Resin**	261.40	26.95
Solid Epoxy Resin Solution*	87.12	9.57
Texaphor 963	1.40	0.91
Super Jet Lampblack	3.00	0.13
LVT 325	50.00	7.15
Acetone	27.20	4.06
Aromatic 100	50.32	6.92
Part A TOTAL	**479.44**	**49.97**
Part B		
Ancamide 801	100.00	12.43
Texaphor 963	2.10	0.28
Byk 333	2.10	0.24
TiPure R-900	50.00	1.50
Wollastocoat 10ES	50.00	2.07
Barytes	300.00	8.38
Ancamide 801	120.90	15.03
n-Butanol	28.60	4.24
Acetone	27.22	4.06
Diacetone Alcohol	17.40	2.22
Part B TOTAL	**698.32**	**40.44**
TOTAL	**1177.8**	**100.4**

* Solid Epoxy Resin Solution is D.E.R. 671 PM75 or Epon 1001 H75 type
** Liquid Epoxy Resin is D.E.R. 331 or Epon 828 type

FORMULATION 4: GRAY SEMI-GLOSS FINISH COAT

Formulation Attributes			
Weight Solids (%)	85.2	Weight/Gallon Part A	9.60
Volume Solids (%)	75.3	Weight/Gallon Part B	13.84
PVC (%)	18.8	Weight per Gallon	11.73
CPVC (%)	66.5	Mix Ratio	1:1
VOC (lb/gallon)	1.30		
VOC (g/L)	155		

TABLE 11 – FORMULATION 4: GRAY SEMI-GLOSS FINISH COAT PROPERTIES

Property	Ancamide 801 Finish
Pot Life[c] (hr)	3.5
Mixed Viscosity[j] (cP)	640
VOC (lb/gallon)	1.30
Set-to-Touch[d](min)	2.0
Hard Dry[d](hr)	10.5
Pencil Hardness[j] (1-day/7-day Cure)	H
Specular Gloss (60°/20° ; 14-day cure)	85
Sag Resistance (mils)	9
Direct Impact Resistance[g] (in-lb)	52
Reverse Impact Resistance[g] (in-lb)	4
Cost per Mil Sq Ft (cents)	1.316

APPENDIX

RESIN, PIGMENT AND ADDITIVE SUPPLIERS

Product	Supplier
Aerosil R202	Evonik
Barium Sulfate	Cimbar
Barytes	Engelhard
Byk 333	BYK Chemie
Byk 361	BYK Chemie
Byk A-500	BYK Chemie
Byk A-530	BYK Chemie
Cab-O-Sil TS-720	Cabot
D.E.R. 331	Dow Chemical
D.E.R. 671-PM-75	Dow Chemical
Disperbyk 101	BYK Chemie
Epon 828	Resolution
Epon 876-CX-90	Resolution
Epon 1001-H-75	Resolution
Halox SZP 391	Halox
Heucophos ZPA	Heubach
J-3175	Mineral Tech
LVT 325 Talc	Harcros
LVT 400 Talc	Harcros
MPA-1078	Elementis (formerly Rheox)
Nevoxy EPXL5	Neville
Nicron 402	Luzenac America
Nuosperse 657	Creanova (formerly Hüls America)
Phosguard J-0815	Mineral Tech
Sparmite F	Elementis Pigments (formerly Harcros)
SuperJet Lampblack	Elementis Pigments
Texaphor 963	Henkel
TiPure R-900	DuPont
Wollastocoat 10AS	NYCO
Wollastocoat 10ES	NYCO
Zeeosphere 400	3M Company

Endnotes:
a Model clearcoats are formulations with 190 EEW liquid epoxy resin, let down to 300 cP with 1:1 v:v xylene:butanol
b ASTM 2369-87
c Pot life for model clearcoat formulations is measured as time to 2000 cP mix viscosity for 100 g mix, based on solids
d ASTM 1640-83
e BK Dry Time Recorder, Stage III Dry Time
f Induction @ 77 °F in 100 g mass, based on solids
g CRS, films prepared after 1 hour induction @ 77 °F in 100 g mass, based on solids
h Cross Hatch Adhesion (ASTM 3359)
i ASTM D455-83, Brookfield RV, Spindle 52
j ASTM 3363-74
k Salt Fog (ASTM B117); 5% salt spray, cabinet temperature 95°F; Scribe Creep (ASTM D1654)
l Prohesion (ASTM G85-77); Scribe Creep (ASTM D1654)
m Cleveland Humidity (ASTM 4585); cabinet temperature 104°F, continuous humidity
n Chemical Resistance is for 24 hour covered spot tests on ~3.5 mil coatings on phosphate treated CRS

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