

ANCAMIDE[®] 261A**Curing Agent****DESCRIPTION**

Ancamide 261A curing agent is a member of a new series of reactive polyamides developed for use in the curing of epoxy resins in coatings and adhesives applications. Special features include good colour, colour stability, excellent corrosion resistance and good adhesion properties. It is freely compatible with a wide range of solvents, including those generally used in epoxy resin based coatings.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Amber Liquid		
Color	7	Gardner	ASTM D 1544-80
Viscosity @ 25°C	35,000-45,000	mPa.s	Brookfield RVTD, Spindle 4
Amine Value	320-380	mg KOH/g	Perchloric Acid Titration
Specific Gravity @ 21°C	0.96		Theoretical value with Bisphenol A diglycidyl ether (EEW190)
Equivalent Wt	120	active N-H	
Recommended use Level	65	PHR	Theoretical value with Bisphenol A diglycidyl ether (EEW=190)
Solids Content	100	%	

ADVANTAGES

- Good corrosion resistance
- Excellent adhesion to a variety of substrates
- Good color and light stability
- Compatible with wide range of solvents

APPLICATIONS

- Adhesives and sealants
- Solvent based marine and protective coatings
- Primers, sealers and coatings for concrete
- Casting
- Concrete repair compounds

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. Do not freeze.

STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamide 261A curing Agent.

TYPICAL HANDLING PROPERTIES AT 65 PHR*

Property	Value	Unit	Method
Gel Time	75	min	150 gms mixed mass @ 25°C
Thin Film Set Time 25°C	7	h	BK Drying Recorder Phase II

SUPPLEMENTARY DATA

Ancamide 261A curing agent is a 100% solids, high-viscosity polyamide. The product is intended for use in combination with or without other amine curing agents in two part room temperature or heat cured adhesives formulations. When used with a standard DGEBA type liquid epoxy resin (EEW=190), Ancamide 261A curing agent offers excellent handling and physical properties and adhesion to various substrates. Ancamide 261A curing agent has a non-critical loading and can be used at levels ranging from 50 to 80 phr with the preferred range being 60-70 phr with a standard DGEBA type liquid epoxy resin.

STARTING POINT FORMULATION

A two-part model formulation (Appendix 1) was prepared using Ancamide 261A curing agent as a main curative. Typical fillers and additives were used in the formulation. A reference formulation was prepared using Ancamide 260A curing agent.

The epoxy and curative portions were mixed together based on theoretical EEW of epoxy and AHEW of a curative using a 1:1 stoichiometric ratio. The mixed adhesive system was used to make single lap shear samples and peel samples for further testing. Standard cold rolled steel was used as a substrate. All samples had 10 mils bondline thickness.

Samples were cured following two cure schedules, (1) seven days ambient temperature cure or (2) 30 minutes at 120°C cure. The samples were tested at ambient temperature following standard test methods.

PERFORMANCE EVALUATION

TABLE 1: SHEAR AND PEEL STRENGTH

	Ancamide 261A based B component	Ancamide 260A based B component (reference)
7 days @ 25°C cure		
CRS/CRS shear strength, psi	2150	2200
CRS/CRS peel strength, pli	14.5	16.0
30 minutes @ 120°C cure		
CRS/CRS shear strength, psi	2100	2100
CRS/CRS peel strength, pli	14.0	14.0

LAP SHEAR STRENGTH

After room temp cure and after heat cure schedules, formulation based on Ancamide 261A curing agent demonstrated performance very similar to the formulation based on Ancamide 260A curing agent (reference). The mode of failure for CRS was 100% cohesive.

PEEL STRENGTH

After both cure schedules, Ancamide 261A curing agent based formulation exhibited peel strength very similar to the Ancamide 260A curing agent based formulation. In both cases, the mode of failure was cohesive.

SOLVENT BASED MARINE AND PROTECTIVE COATINGS APPLICATION

STARTING POINT FORMULATIONS

Appendix 2 contains both anti-corrosive primer and a semi-gloss white top-coat formulations based on Ancamide 261A curing agent. As with all solvent based coatings, dry times are influenced by solvent choice, thus dry times may vary depending upon the ratio of polar and non-polar solvents incorporated into the coating formulation. Pot life as measured by the time for the mix to double in viscosity is in the 6 hour range, which is typical for such solvent based polyamide systems.

Primer formulation A261A-1, with Solid Epoxy Resin and Liquid Epoxy Resin, is 54% volume solids. PVC is 35% for both formulations. The primer formulation is compatible with a variety of different let down solvents (including xylene, nbutanol, MIBK, methoxy-propanol, etc) and can be further let down if required for additional spray applications. The coating formulation can be applied with conventional spray equipment or brush applied to the steel substrate.

The paint systems were evaluated for corrosion resistance properties using salt spray, distilled water immersion and NaCl 3.5% immersion at room temperature. After 1000 hrs exposure, coatings exhibit excellent corrosion resistance. No signs of field blisters were detected using the above tests, with panels exhibiting no scribe creep in the salt spray test. For comparative purposes, Ancamide 260A curing agent was also included in the test study as the "industry" standard reference. In all the corrosion resistance tests carried out, both Ancamide 261A and Ancamide 260A curing agents demonstrated comparable performance.

PERFORMANCE EVALUATION AND RESULTS

Formulation A261A-1 was evaluated in 5% salt spray, distilled water immersion at room temperature and NaCl 3.5% immersion at room temperature, following a 10 day ambient cure of applied coatings.

Coatings were applied to grit blasted, hot rolled steel (SA2.5), using conventional spray equipment, in double coats to give coatings with a 75-100 μ (3-4 mils) dry film thickness (DFT). In salt spray, (ASTM B-117) panels were scribed and evaluated for field blisters using the US Federal Standard Test Method 141a, Method 6461 and the scribe creep was rated in accordance with ASTM D-1654. Similar evaluations were made for panels placed in NaCl 3.5% immersion at room temperature and distilled water immersion. Panels exposed to distilled water immersion were not scribed and coatings were assessed for blistering only. These tests also included evaluations for changes in visual appearance. The results obtained are presented in Table 4, 5 and 6. After 1000 h salt fog exposure, formulations with Ancamide 261A and Ancamide 260A curing agents both exhibit excellent resistance. These formulations also demonstrated excellent water and salt water resistance with no signs of field blistering being observed following 1,000 h continuous testing.

TABLE 2: SALT SPRAY RESISTANCE - ANCAMIDE 261A AND ANCAMIDE 260A CURATIVES (1000 H)

	Ancamide 261A	Ancamide 260A
Overall rating	9-10	9-10
Scribe creep	0-1mm	0-1mm
Cross hatch adhesion after 1,000 h	5B	5B

5% salt spray, cabinet temperature 35°C - ASTM B-117, film thickness 75-100 μ (3-4 mils)

Rating: 10 = Best (no blisters), 0 = Worst

TABLE 3: DISTILLED WATER IMMERSION AT RT - ANCAMIDE 261A AND ANCAMIDE 260A CURATIVES (1000 H)

	Ancamide 261A		Ancamide 260A	
	Before Immersion	After 1,000 h	Before Immersion	After 1,000 h
Cross hatch adhesion	5B	5B	5B	5B
Gloss/ Appearance	No change	No change	No change	No change

5B indicates no loss of adhesion

TABLE 4: NA CL 3.5% IMMERSION AT RT - ANCAMIDE 261A AND ANCAMIDE 260A CURATIVES (1000 H)

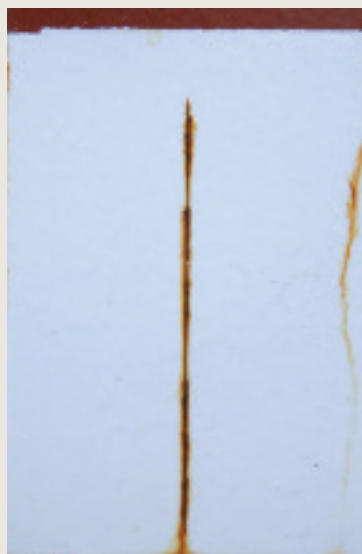
	Ancamide 261A		Ancamide 260A	
	Before Immersion	After 1,000 h	Before Immersion	After 1,000 h
Cross hatch adhesion	5B	5B	5B	5B
Gloss/ Appearance	No change	No change	No change	No change
Scribe Creep	0 mm	0 mm	0 mm	0 mm

5B indicates no loss of adhesion

SALT SPRAY PANELS 1000 H EXPOSURE

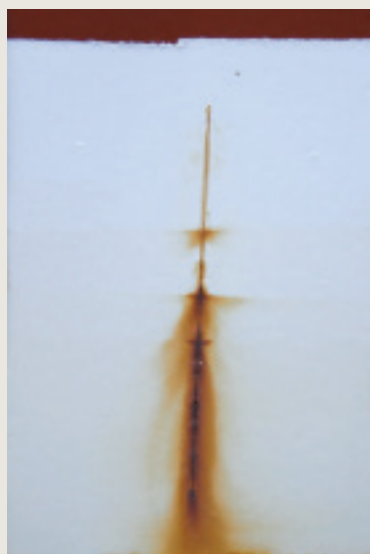


Ancamide 260A

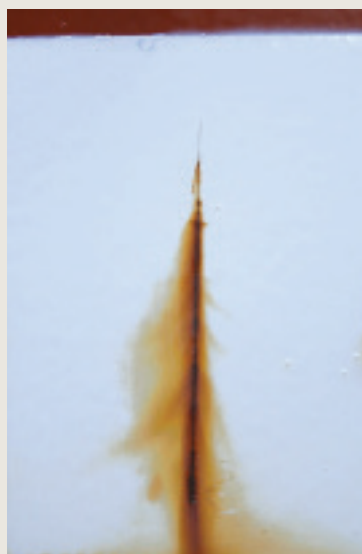


Ancamide 261A

NACL 3.5% IMMERSION AT ROOM TEMPERATURE 1000 H EXPOSURE



Ancamide 260A



Ancamide 261A

APPENDIX I

TABLE 5: ANCAMIDE 261A CURATIVE: TWO-PART ADHESIVE FORMULATION

A-Component (g)			
1. Epoxy resin	Liquid BADGE EEW = 190		60
2. Filler	Microtuff AG 445	Speciality Minerals	38
3. Additive	Cab-O-Sil TS 720	Cabot Industries	2
Total A			100

A-Component Manufacture Procedure:

- Charge components 1-3 and stir homogeneous at medium to high shear

B-Component (g)			
Control			
1. Curing agent	Ancamide 260A	Evonik	55
2. Filler	Microtuff AG 445	Speciality Minerals	24
3. Filler	Toyal 101 Aluminium powder	Toyal- America	20
4. Additive	Cab-O-Sil TS 720	Cabot Industries	1
Total B			100

B-Component (g)			
Ancamide 261A			
1. Curing agent	Ancamide 261A	Evonik	40
2. Filler	Microtuff AG 445	Speciality Minerals	24
3. Filler	Toyal 101 Aluminium powder	Toyal- America	20
4. Additive	Cab-O-Sil TS 720	Cabot Industries	1
Total B			100

B-Component Manufacture Procedure:

- Charge components 1-4 and stir homogeneous at medium to high shear

TABLE 6: TECHNICAL DATA

EEW of A Component	316
AHEW of B Components	218
Mixing ratio (by weight)	100 of A : 68 of B
Solid content wt. (%)	100

APPENDIX II

TABLE 7: FORMULATION A261-1: ANCAMIDE 261A CURING AGENT ANTI- CORROSIVE PRIMER

A-Component (g)			Anti-Corrosive Primer
1. Epoxy Resin	Solvented SER EEW= 670	75% in xylene	209.90
2. Epoxy Resin	Liquid BADGE EEW= 190		33.40
3. Epodil L	Epodil® 748 reactive diluent	Evonik	28.60
4. Dispersant	Disperbyk 163	Byk Chemie	3.80
5. Additive	Bentone SD-2 8.		8.60
6. Solvent	MIBK		23.90
7. Solvent	Xylene		181.30
8. Solvent	Dowanol PM	Dow	19.10
9. Filler	Barite		162.20
10. Filler	Talc 400 mesh		76.30
11. Filler	Quartz 400 mesh		171.80
12. Pigment	Zinc Phosphate	Heubach	33.40
13. Pigment	Bayferrox 130M	Bayer	47.70
TOTAL A			1000.00
B-Component (g)			
1. Curing Agent	Ancamide 261A	Evonik	55.41
2. Additive	AncamineR K54 accelerator	Evonik	3.50
3. Solvent	Xylene		64.99
4. Solvent	Butanol		25.00
			148.90
TOTAL A+B			1148.90

After mixing Part A and B, apply a 30 minute induction time prior to application.

TABLE 8: TECHNICAL DATA

Mixing Ratio	Volume A:B	4:1
Density (g/ml)	- Mix	1.36
Solid Content (Weight %)	- Mix	67.89
Solid Content (Volume %)	- Mix	54.63
PVC	%	35.58
Pot-life (h)	h	>5
Gloss (60°)		10
Hard Dry	h	16.00
Epoxy/Amine		1.08

TABLE 9: FORMULATION A261-2: ANCAMIDE 261A CURING AGENT TOP-COAT

			Top-Coat
A-Component (g)			
1. Epoxy Resin	Solvented SER EEW= 670	75% in xylene	379.80
2. Epoxy Resin	Liquid BADGE EEW= 190		43.40
4. Additive	Anti-Terra U-80	Byk Chemie	4.30
5. Additive	Bentone SD-2		10.90
6. Additive	Modaflow Resin		1.60
7. Additive	Cymel 303		10.90
8. Additive	MPA 2000X		8.70
9. Solvent	Xylene		119.40
10. Filler	Barite		86.80
11. Filler	Quartz 400 mesh		108.50
12. Pigment	Titanium Dioxide		195.30
13. Solvent	Butanol		30.40
TOTAL A			1000.00
B-Component (g)			
1. Curing Agent	Ancamide 261A	Evonik	92.20
2. Additive	Ancamine K54	Evonik	4.00
3. Solvent	Xylene		52.00
4. Solvent	Butanol		11.80
			160.70
TOTAL A+B			1160.70

After mixing Part A and B, apply a 30 minute induction time prior to application.

TABLE 10: TECHNICAL DATA

Mixing Ratio	Volume A:B	4:1
Density (g/ml)	- Mix	1.32
Solid Content (Weight %)	- Mix	73.15
Solid Content (Volume %)	- Mix	69.58
PVC	%	19.15
Pot-life (h)	h	>5
Gloss (60°)		65
Hard Dry	h	16.00
Epoxy/Amine		1.05

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