Product information

ANCAMIDE® 2050

Curing Agent

DESCRIPTION

Ancamide 2050 curing agent is a special polyamide adduct designed for use with liquid epoxy resins in two-part, ambient-cure coatings.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Clear, Amber Liquid		
Color	7	Gardner	ASTM D 1544-80
Viscosity @ 77°F	4,000	cP	ASTM D 445-83, Brookfield, RVTD, Spindle 4
Amine Value	225	mg KOH/g	Perchloric Acid Titration
Specific Gravity @ 77°F	1.02		ASTM D 1475-85
Flash Point	>200	°F	Seta Flash Closed Cup
Equivalent Wt/{H}	150		
Recommended Use Level	70	PHR	(EEW=190)

BENEFITS

- Good cure at 50ºF
- Good corrosion resistance
- High aqueous acid and Skydrol[A] resistance
- Zero induction time at ambient temperature
- Moderate viscosity
- Good flexibility
- High-gloss finish
- Noncritical loading (70–100 phr)

APPLICATIONS

- High-solids marine and maintenance coatings
- High-solids lining coatings
- High-solids primers and coatings for concrete
- Sealants and putties

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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 2050 curing agent.

TYPICAL CURE SCHEDULE

7 days at ambient temperature.

TYPICAL HANDLING PROPERTIES *

Property	70 phr	100 phr	Unit	Method
Mixed Viscosity @ 77°F	6,400	5,000	cP	ASTM D 445-83, Brookfield, RVTD, Spindle 4
Gel Time (150g mix @ 77°F)	100	80	min	Techne GT-4 Gelation Timer
Thin Film Set Time @ 77°F	7.0	6.0	hr	BK Drying Recorder
Peak Exotherm (100g mix @ 77°F)	95	104	min	ASTM D 2471-71
Peak Exotherm Time	136	133	min	ASTM D 2471-71

TYPICAL PERFORMANCE*

(7 days @ 77°F)	70 phr	100 phr	Unit	Method
Glass Transition Temperature	108	—	°F	ASTM D 3418-82
Heat Deflection Temperature	108	90	°F	ASTM D 648 @ 264 psi

* Ancamide 2050 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=190) epoxy resin.

SUPPLEMENTARY DATA

FORMULATIONS: Exhibits 1 and 2 show formulations for an aluminized epoxy mastic and an anticorrosive primer based on Ancamide 2050 curing agent.

HANDLING PROPERTIES: Table 1 compares the handling properties of Ancamide 2050 curing agent and a conventional polyamide such as Ancamide 350A curing agent. The low viscosity of the Ancamide 2050 curing agent allows formulators to develop high-solids coatings with lower VOC. Ancamide 2050 curing agent has excellent resistance to blush and exudation, so an induction time is not necessary at ambient temperature. Pot life for Ancamide 2050 curing agent is less than that of Ancamide 350A curing agent, but is still sufficient. The aluminized mastic and anticorrosive primer formulations in Exhibits 1 and 2 have pot lives of 5 hours and 8 hours, respectively.

The comparative dry times at ambient and low temperature for Ancamide 2050 and Ancamide 350A curing agents are also shown in Table 1. At ambient temperature, Ancamide 2050 curing agent has a tack-free time of 6-7 hours, depending on use level (100 vs 70 phr) compared with 11 hours for Ancamide 350A curing agent. At 50#F, the tack-free time of Ancamide 2050 is 19-24 hours vs 36 Hours for Ancamide 350A curing agent.

TABLE 1: HANDLING PROPERITES

Property	Ancamide 2050	Ancamide 350A	Unit
Viscosity	4,000	11,000	cP
Mixed Viscosity	5,000-6,400	18,600	cP
Pot Life	80-100	200	min
Tack Free @ 72°F	6-7	11	h
Tack Free @ 50°F	19-24	36	h
Use Level	70-100	60	phr

Curing agents were mixed with liquid epoxy (EEW=190) at use Levels indicated. The full formulations in Exhibits 1 and 2 have dry to touch times of 3.5-4 hours and dry through times of 9-10 hours at ambient temperature.

FILM PROPERTIES: Table 2 shows comparisons of flexibility, gloss, VOC and film appearance for Ancamide 2050 and Ancamide 350A curing agents. Formulators can use Ancamide 2050 curing agent to achieve superior flexibility by taking advantage of its noncritical loading, and by increasing its use level to 100 phr.

Ancamide 2050 at 70 phr has comparable flexibility to Ancamide 350A. When Ancamide 2050 curing agent's use rate increases to 100 phr, reverse impact in a liquid epoxy formulation increases from 12 in-lbs to 110 in-lbs. Gloss is superior to Ancamide 350A, and Ancamide 2050 can achieve lower VOC in similar formulations compared with Ancamide 350A curing agent. Films utilizing Ancamide 2050 curing agent also have very good appearance over a range of temperature and humidity conditions.

TABLE 2: FILM PROPERITES

Property	Ancamide 2050	Ancamide 350A	Unit
Direct Impact			
500 EEW resin[a]	44	52	in/lb
400 EEW resin[a]	38	33	in/lb
300 EEW resin[a]	20	20	in/lb
200 EEW resin[a]	20	12	in/lb
Reverse impact[b]	12/110	<20	in/lb
1/8 in mandrel bend[b]	Pass	Pass	
Gloss (60º)[c]	100	90	
Voc (lb/gal)[d]	1.7	1.8	lb/gal
Film appearance[e]			
1 Day, 77ºF, 50% RH	Clear, tack-free		
1 Day, 50ºF, 90% RH	Haze, tacky		
1 Day, 40ºF, 80% RH	Clear, very tacky		
7 days, 50ºF, 90% RH	Haze, tack-free		
7 days, 40ºF, 80% RH	Clear, tacky		

(a) Pigmented formulations with usage of 70 phr for Ancamide 2050 and 60 phr for Ancamide 350A.
(b) With liquid epoxy (EEW=190), with Ancamide 2050 being used at 70 phr and 100 phr, respectively. Ancamide 350A is used at stoichiometry. Film thickness 10 mils DFT. Measured per ASTM 2794.
(c) Pigmented formulations based on solid epoxy resin (EEW=325) were mixed with each curing agent, applied to cold rolled steel panels (5) (5 mil DFT) and cured 7 days at 72°F before testing.
(d) In pigmented liquid epoxy resin (EEW=190) at stoichiometry.
(e) Unpigmented formulations with liquid epoxy resin (EEW=190).

CORROSION RESISTANCE: The aluminized epoxy mastic and anticorrosive primer formulations shown in Exhibits 1 and 2 were evaluated for salt spray resistance and humidity resistance after 1000 hours of exposure. Both formulations performed very well as detailed in Tables 3 and 4.

TABLE 3: SALT SPRAY RESISTANCE - ANCAMIDE 2050

	General Corrosion	Scribe Corrosion	Field Blistering	Blister Size
Aluminium Mastic	10	5.5-6.0	9	6
Red Primer	10	8.0-8.5	9-10	8.5

5% salt spray, cabinet temperature 95°F — ASTM B-117, film thickness 2.5 mils. Rating: 10 = Best; 0 = Worst.

TABLE 4: HUMIDITY EXPOSURE - ANCAMIDE 2050

	General Corrosion	Scribe Corrosion	Field Blistering	Blister Size
Aluminium Mastic	10	10	10	none
Red Primer	10	10	10	none

Continuous 100% Humidity Exposure — ASTM D-2247, cabinet temperature 122°F, film thickness 2.5 mils. Rating: 10=Best, 0=Worst

ADHESION: The Ancamide 2050-based primer and aluminum mastic formulations were evaluated for adhesion to heavy, hot rolled steel per ASTM D-4541, Pull-Off adhesion. Panels were blasted to an SSPC-SP5 white metal quality with a mil profile of 3.0 mils. Greater than 400 psi was required to cause failure, and all failures occurred in the adhesive. No cohesive failure in the coating nor adhesive failure at any interface was observed. Both formulations showed good results.

CHEMICAL RESISTANCE: Table 5 contains chemical resistance data for Ancamide 2050 curing agent. Evaluations of Ancamide 2050 at 70 phr and 100 phr with standard liquid bisphenol A epoxy resin (EEW=190) in immersion conditions were made. Improved results are seen at the 70 phr use level compared with the higher loading.

Overall, Ancamide 2050 curing agent shows good resistance after 28 days to 10% acetic acid, Skydrol, 70% sulfuric Acid and deionized water. Performance is not as good for solvents and alcohols. In a comparison with several representative reagents, Ancamide 2050 out-performed Ancamide 350A curing agent.

TABLE 5: CHEMICAL RESISTANCE

Reagent	Immersion Time (days)	Ancamide 2050 (70 phr)	Ancamide 2050 (100 phr)	Ancamide 350A (60 phr)
Deionized Water	1	0.32	0.39	
	3	0.51	0.74	
	7	0.69	0.98	
	28	1.49	2.09	
70% Sulfuric Acid	1	0.20	0.47	0.29
	3	0.29	0.62	0.71
	7	0.30	0.64	1.63
	28	0.47	0.51	10.30
10% Acetic Acid	1	0.93	2.50	7.57
	3	1.55	4.21	13.88
	7	2.20	6.43	20.72
	28	4.47	14.23	36.78
Skydrol LD-4	1	0.05	0.02	
	3	0.13	0.05	
	7	0.14	0.01	
	28	0.57	0.43	
Ethanol	1	2.06	2.81	3.26
	3	3.58	4.81	4.73
	7	5.10	7.23	6.09
	28	11.80	10.67	10.40
Xylene	1	3.53	5.09	
	3	6.40	9.03	
	7	9.50	D	
	28	D	-	
Butyl Cellosolve	1	1.90	2.77	
	3	3.50	4.87	
	7	5.27	7.40	
	28	12.13	D	
Toluene	1	7.67	11.15	13.66
	3	12.12	D	26.32
	7	D	-	D
	28	-	-	-
1,1,1 Trichloroethane	1	5.43	8.43	
	3	9.81	14.90	
	7	14.97	23.60	
	28	D	D	

* Chemical resistance data is expressed as % weight change, and testing was completed in accordance with ASTM D 543-84.
** Formulated with liquid epoxy resin (EEW=190) and cured 7 days at ambient temperature before Immersion.

EXHIBIT 1: ANCAMIDE 2050 CURING AGENT ALUMINUM MASTIC PRELIMINARY FORMULATION

PART A		**lb**	**gal**
Liquid DGEBA Epoxy		300.7	31.00
Cabosil TS 720	Cabot	5	0.33
Mix well, then add at high speed:			
Lansford L243	Silberline	125.4	10.17
Mix well, then add at low speed:			
Aromatic 100	Exxon	48.5	6.67
Beetle 216-8	Cyanamid	20.0	2.30
Totals		**499.6**	**50.47**
PART B			
Ancamide 2050	Evonik	241.6	28.55
MPA-1078	Rheox	8.0	1.08
10 AS Wollastokup	NYCO		9.09
Grind to 5 Hegman, reduce speed and add:			
Aromatic 100	Exxon	60.6	8.34
Diacetone Alcohol	Union Carbide	23.5	3.00
Cabosil TS 720	Cabot	6.5	0.42
Totals		**560.2**	**50.48**

PROPERTIES

Volume Solids	73.9%	VOC	1.9 lb/gal
PVC	18.1%	Mixing Ratio (by volume)	1:1
CPVC	42.2%	Pot Life, h	5
PVC/CPVC	.429	Dry to Touch, h	4
		Dry Through, h	10
Weight/gallon, Part A	9.90		
Weight/gallon, Part B	11.10		
Weight/gallon	10.50		

EXHIBIT 2: ANCAMIDE 2050 CURING AGENT ANTICORROSIVE PRIMER PRELIMINARY FORMULATION

PART A		**lb**	**gal**
Liquid DGEBA Epoxy		233.7	24.093
MPA-1078	Rheox	4.0	0.541
Mix well, then add at high speed:			
TiPure R-900	DuPont	25.0	0.751
10 Wollastokup AS	NYCO	370.0	15.289
Disperse to 5 Hegman. Reduce speed and add:			
Xylene	Ashland	85.9	11.848
Totals		**718.6**	**52.522**
PART B			
Ancamide 2050	Evonik	195.8	23.310
MPA-1078	Rheox	4.0	0.541
Beetle 216-8	Cyanamid	15.0	1.724
Mix well at high speed, then add:			
Red Iron Oxide J-3100	Mineral Pigments	60.0	1.441
Beaverwhite 325	Cyprus	96.7	4.204
Phosplus J-0866	Mineral Pigments	141.4	5.065
Disperse to 5 Hegman and 125ºF. Reduce speed and add:			
Diacetone Alcohol	Union Carbide	31.3	3.997
Super High Flash Naptha	Ashland	89.0	12.242
Totals		**633.2**	**52.527**

PROPERTIES

Volume Solids	71.8%	VOC	2.07 lb/gal
PVC	35.5%	Mixing Ratio (by volume)	1:1
CPVC	54.8%	Pot Life, h	8
PVC/CPVC	0.647	Dry to Touch, h	3.5
		Dry Through, h	9
Weight/gallon, Part A	13.68		
Weight/gallon, Part B	12.06		
Weight/gallon	12.87		

Ancamide® is a registered trademark of Evonik Industries AG or one of its subsidiaries.

EVONIK OPERATIONS GMBH
Business Line Crosslinkers
Paul-Baumann-Str. 1
45764 Marl
Germany

www.evonik.com/crosslinkers
Product Information: APCSE@evonik.com
Sample Request: APCSE@evonik.com

EVONIK CORPORATION
Business Line Crosslinkers
7001 Hamilton Boulevard
Trexlertown, PA 18087
USA

CrosslinkersProdinfo@evonik.com
Crosslinkers-Samples@evonik.com

EVONIK SPECIALTY CHEMICALS (SHANGHAI) CO., LTD.
Business Line Crosslinkers
55, Chundong Road
Xinzhuang Industry Park
Shanghai, 201108
China
CL-Asiainfo@evonik.com
CL-Asiainfo@evonik.com