Product information

ANCAMINE® 2505

Curing Agent

DESCRIPTION

Ancamine 2505 curing agent is a modified cycloaliphatic amine intended for use with liquid epoxy resins. It imparts very rapid development of physical properties at ambient and low temperatures, for a fast return to service. The product yields formulations with very good chemical resistance, waterspot resistance, and resistance to amine blush. These properties make Ancamine 2505 curing agent ideal for formulating epoxy flooring, coatings and linings.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Amber Liquid		
Colour	8	Gardner	ASTM D 1544-80
Viscosity @ 77°F	495	cP	ASTM D 445-83, Brookfield, RVTD, Spindle 4
Specific Gravity @ 77°F	1.05		ASTM D 1475-85
Amine Value	270	mg KOH/g	Perchloric Acid Titration
Flash Point (closed cup)	230	°F	Seta Flash Closed Cup
Equivalent Wt/{H}	110		
Recommended Use Level	58	phr	EEW=190

ADVANTAGES

- Rapid cure and property development at ambient and lowtemperatures
- Very good chemical resistance
- Resistance to amine blush and waterspotting at ambient and low temperatures
- Low cost-in-use

APPLICATIONS

- Industrial flooring
- Chemically resistant mortars and high-solids Coatings
- Secondary containment linings

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.

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STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamine 2505 curing agent.

TYPICAL CURE SCHEDULE

2-7 days at ambient temperature.

TYPICAL HANDLING PROPERTIES *

Property	A*	B*	Unit	Method
Use Level	58	56	phr	
Mixed Viscosity @ 77°F	2,900	950	cP	ASTM D 445-83, Brookfield, RVTD, Spindle 4
Gel Time				
150 g mix @ 77°F	31	37	min	Techne GT-4 Gelation Timer
150 g mix @ 50°F	100	140	min	Techne GT-4 Gelation Timer
Thin Film Set Time @ 77°F	3.5	4.8	h	BK Drying Recorder
@ 50°F	11	16	h	BK Drying Recorder
@ 40°F	13	—	h	BK Drying Recorder
Peak Exotherm (150 g mix @ 77°F)	155	155	°F	ASTM D 2471-71

TYPICAL PERFORMANCE

7 day cure @ 77°F	A*	B*	Unit	Method
Glass Transition Temp	126	120	°F	ASTM D 3418-82
Compressive Strength @ yield	10,700	7,400	psi	ASTM D 695-85
Compressive Modulus	277	220	thousand psi	ASTM D 695-85
Tensile Strength	8,000	5,900	psi	ASTM D 638-86
Tensile Modulus	408	346	thousand psi	ASTM D 638-86
Tensile Elongation @ break	6	14	%	ASTM D 638-86
Flexural Strength	12,900	9,000	psi	ASTM D 790-86
Flexural Modulus	459	325	thousand psi	ASTM D 790-86
Hardness	83	82	Shore D	ASTM D 2240-86
60° Specular Gloss @ 77°F	129	139		ASTM D 523-8
60° Specular Gloss @ 40°F	126	139		ASTM D 523-8

A* Ancamine 2505 formulated with standard bisphenol-A (DGEBA, EEW=190) resin
B* Ancamine 2505 with 90% bis-A resin (EEW=190) and 10% Epodil® 748 diluent (C_{12}-C_{14} alkyl glycidyl ether)

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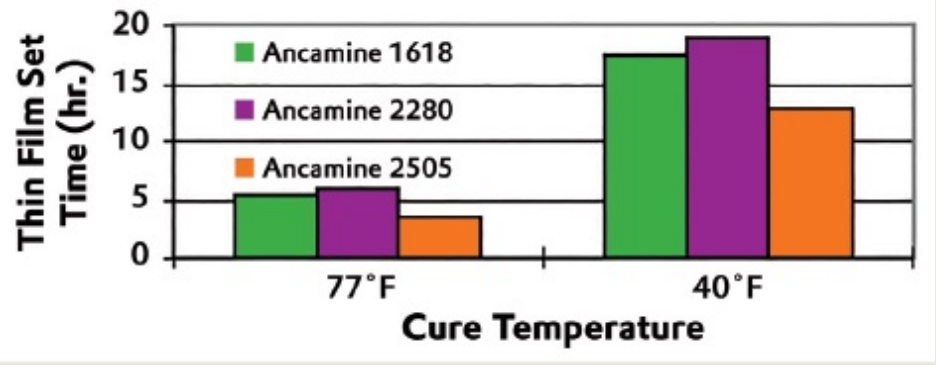
SUPPLEMENTARY DATA

CURE SPEED: Ancamine 2505 curing agent provides fast cure and property development at ambient and low temperatures without accelerators, allowing application under a range of temperatures and a quick return to service. The thin film set time of Ancamine 2505 curing agent with bis-A based liquid resin in a 3-mil film is 3.5 hours at 77°F, and 11 hours at 50°F. Cure speed is faster than with most cycloaliphatic curing agents. Figure 1 shows the thin film set time of Ancamine 2505 curing agent versus cycloaliphatic curing agents, Ancamine 1618 and Ancamine 2280, with bis-A based liquid resin at 77°F and 40°F.

FIGURE 1: THIN FILM SET TIME COMPARISON



HARDNESS DEVELOPMENT: Gel time and thin film set time define the development of cure well, but often do not accurately predict the development of hardness. Shore D hardness development was measured as a function of 77°F cure for a 1/4-inch thick casting. The results are presented in Table 1.
The fast cure and rapid hardness development of formulations cured with Ancamine 2505 curing agent make it ideal for flooring, coatings and mortars applied at ambient or low temperatures. At ambient temperature cure, Ancamine 2505 curing agent gives a Shore D hardness of 78 within 24 hours. This indicates that it is possible to formulate a system with Ancamine 2505 curing agent that gives an overnight walk-on at ambient temperature.
If even faster thin film set and hardness development is needed, Ancamine 2505 curing agent can be accelerated with fast modified aliphatic amine curing agents such as Ancamine 2089M, Ancamine 2205, Ancamine 2432 or Ancamine 1856 curing agents.

BLUSH RESISTANCE: Ancamine 2505 curing agent gives high-gloss films with very low or no amine blush when cured at ambient and low temperatures. When combined with Standard bis-A resin, it gives a very high 60° gloss of 129 when cured at 77°F. High gloss at ambient cure conditions is typical of most modified cycloaliphatic curing agents, but Ancamine 2505 curing agent does not lose it's high gloss and good film appearance characteristics even under low-temperature conditions. When cured at 40°F, the film is smooth and clear with a 60° gloss of 126 with bis-A resin. Most other fast curing hardeners show amine blush and film haziness under low temperature cure conditions.

WATERSPOT RESISTANCE: Waterspotting can be caused by water drops contacting a coating before it is cured. Ancamine 2505 curing agent was tested for waterspot resistance in formulations with both undiluted bis-A based resin and 90% bis-A based resin/ 10% Epodil® 748 diluent blend. 10 mil films of each formulation were cured for eight hours at 72°F and 55% relative humidity. After eight hours, a cotton ball saturated with water was placed on the films. The films were then placed in the incubator for another 24 hours at 72°F and 55% relative humidity. After this period, the films were examined for white spots.

TABLE 1: ANCAMINE 2505 CURING AGENT HARDNESS DEVELOPMENT

Number of Days Cure	1	3	7	Method
77 °F Cure Shore D Hardness	78	81	83	ASTM D 2240-86

Note: Ancamine 2505 with bis-A based (EEW=190) resin.

The Ancamine 2505 formulations showed a complete Absence of spots, indicating very good water-spot resistance at ambient cure conditions.

Ancamine 2505 curing agent was also tested for waterspot resistance at low cure temperatures. A 10-mil film of Ancamine 2505 curing agent with bis-A based resin was cured for 24 hours at 45°F and 90% relative humidity. After 24 hours, a cotton ball saturated with water was placed on the film. The film was then placed in the incubator for 24 hours at 45°F and 90% relative humidity. The film showed minimal waterspotting. Most amine-based curing agents waterspot severely under these aggressive conditions, but Ancamine 2505 curing agent gives excellent waterspot resistance.

CHEMICAL RESISTANCE: Chemical immersion studies following ASTM D543 were performed on coupons using standard bis-A (DGEBA, EEW=190) liquid resin cured with Ancamine 2505 curing agent for 7 days at 77°F. Three samples were tested for each reagent. Table 2 shows the average percentage weight change after 3 days and 28 days immersion in various chemicals at 77°F.
Spillage resistance studies were conducted on Ancamine 2505 curing agent formulated with a 90% bis-A resin (EEW=190) and 10% Epodil 748 diluent (C_{12}-C_{14} alkyl glycidyl ether) blend. Samples were cured for 7 days at 77°F before testing; three samples were tested for each reagent. The immersion/recovery schedule for the testing is shown in Table 3. Percentage weight change and Shore D hardness were measured after each of the immersion periods. The samples were then allowed to recover before reimmersion for the next time period. Hardness retention is relevant in flooring applications where it indicates the ability of the floor to support traffic after exposure to chemical spills. The results of this study are presented in Table 4.
These studies show that Ancamine 2505 curing agent imparts very good resistance to a variety of chemicals. The chemical resistance of Ancamine 2505-cured formulations can be optimized for specific chemicals using different resin blends, such as bisphenol-F and multifunctional novolac resins.

TABLE 2: CHEMICAL RESISTANCE FOR ANCAMINE 2505 — FORMULATION % WEIGHT CHANGE AS A FUNCTION OF TIME (CONTINUOUS IMMERSION)

Reagent	Ancamine 2505 / Bis-A Resin	
	After 3 days % wt. change	After 28 days % wt. change
Deionized Water	0.43	1.44
Methanol	11.1	7.9
Ethanol	3.45	9.26
Toluene	0.25	3.22
Xylene	0.00	0.69
Butyl Cellosolve	1.12	4.26
Methyl Ethyl Ketone	14.4	11.6
10% Lactic Acid	0.89	2.88
10% Acetic Acid	1.98	6.00
70% Sulfuric Acid	0.04	0.17
98% Sulfuric Acid	Destroyed	Destroyed
50% Sodium Hydroxide	0.00	-0.11
Bleach	0.35	0.56
Trichloroethane	0.00	0.24

Note: Samples cured for 7 days at 77°F before testing. They were tested in accordance with ASTM D543-84.

TABLE 3: SPILLAGE RESISTANCE TEST METHOD SCHEDULE

Castings of 1/8" thickness are immersed for specified time period. Sample is then removed, weighed, and hardness tested immediately. Sample is then allowed to recover for specified time before re-immersion.

3 hr imm → test → 24 hr recovery
24 hr imm → test → 24 hr recovery
3 day imm → test → 3 day recovery
7 day imm → test → 7 day recovery
28 day imm → test → 7 day recovery
90 day imm → test

TABLE 4: SPILLAGE RESISTANCE FOR ANCAMINE 2505 WITH 90% BIS-A RESIN/ 10% EPODIL 748
% WEIGHT CHANGE AND SHORE D HARDNESS AS A FUNCTION OF TIME

Reagent	Initial	Test After 3 hr		Test After 24 hr		Test After 3 days		Test After 7 days		Test After 28 days		Test After 90 days	
	Hard	% wt	Hard	% wt	Hard	% wt	Hard	% wt	Hard	% wt	Hard	% wt	Hard
10% Acetic Acid	82	0.48	80	1.32	79	2.59	77	4.12	74	7.03	70	10.7	69
10% Lactic Acid	82	0.17	81	0.49	80	1.02	80	1.60	79	2.65	79	3.62	81
Toluene	82	0.12	81	1.81	76	7.20	60	13.9	52	14.1	55	13.0	66
Xylene	82	0.02	81	0.05	81	0.81	80	1.90	76	4.66	69	8.17	74
Trichloroethane	82	0.04	82	0.14	81	1.26	81	2.75	79	6.33	75	12.1	74
Methanol	82	2.48	67	6.65	44	Destroyed							
Ethanol	82	0.92	76	2.37	66	4.52	58	7.08	55	6.41	53	3.45	66
Butyl Cellosolve	82	0.26	79	1.04	77	2.6	72	4.13	69	7.27	64	13.7	59
Methyl Ethyl Ketone	82	5.53	60	17.4	26	Destroyed							
Skydrol	82	0.05	80	0.04	81	0.04	81	0.03	80	-0.18	81	-0.85	81
70% Sulfuric Acid	82	0.17	82	0.21	82	0.16	82	0.19	82	0.13	82	0.13	82
98% Sulfuric Acid	82	-20.9	72	Destroyed									
Deionized Water	82	0.12	81	0.31	80	0.61	79	0.94	79	1.49	78	1.74	81
50%Sodium Hydroxide	82	0.01	82	0.01	82	0.01	82	0.01	82	-0.13	81	-0.20	83
Bleach	82	0.09	81	0.34	80	0.50	80	0.68	79	0.99	77	0.22	82

Note: Samples were cured for 7 days at 77°F before testing.

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