

ANCAMINE® 2423 Curing Agent**DESCRIPTION**

Ancamine 2423 curing agent is a low-color cycloaliphatic amine adduct intended for use with liquid epoxy resins. It imparts very rapid development of physical properties at ambient and low temperatures, and yields formulations with excellent resistance to acids and good waterspot resistance. These properties make Ancamine 2423 ideal for formulating flooring, grouts and linings.

ADVANTAGES

- Excellent resistance to organic acids
- Very rapid cure and property development at ambient and low temperatures
- Good resistance to blush and waterspotting
- Good color and color stability

APPLICATIONS

- Self-leveling, trowelable and pebble finish flooring
- Chemically resistant mortars and grouts
- High-solids coatings
- Secondary containment linings
- Tile grouts

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 Ancamine 2423 curing agent.

TYPICAL CURE SCHEDULE

2-7 days at ambient temperature.

TABLE 1: TYPICAL PROPERTIES

Appearance	Clear Liquid
Color ¹ (Gardner)	1
Viscosity ² @ 77°F (cP)	1,200
Specific Gravity ³ @ 77°F	1.02
Amine Value ⁴ (mg KOH/g)	269
Flash Point ⁵ (closed cup) (°F)	237
Equivalent Wt/{H}	120
Recommended Use Level (phr, EEW=190)	60

TABLE 2: TYPICAL HANDLING PROPERTIES

	A*	B*
Use Level (phr)	60	58
Mixed Viscosity ² @ 77°F (cP)	4,280	2,020
Gel Time ⁶ (min)		
(150 g mix @ 77°F)	17	21
(150 g mix @ 50°F)	50	72
Thin Film Set Time ⁷ @ 77°F (h)	3.5	4.5
@ 50°F	7.0	8.0
@ 40°F	9.5	—
Peak Exotherm ⁸ (150 g mix @ 77°F) (°F)	240	235

TABLE 3: TYPICAL PERFORMANCE

7 day cure @ 77°F	A*	B*
Glass Transition Temp ⁹ (°F)	126	118
Compressive Strength @ yield (psi)	11,800	10,100
Compressive Modulus ¹⁰ (thousand psi)	315	283
Tensile Strength ¹¹ (psi)	8,900	7,200
Tensile Modulus ¹¹ (thousand psi)	480	337
Tensile Elongation ¹¹ @ break (%)	3.2	6.7
Flexural Strength ¹² (psi)	15,300	11,300
Flexural Modulus ¹² (thousand psi)	556	394
Hardness ¹³ (Shore D)	84	83
60° Specular Gloss ¹⁴	126	—
Abrasion Resistance ¹⁵ weight loss (grams) (@ 1,000 cycles with wheel no. 10)	—	0.045
Mar Resistance ¹⁶ (kg)	—	1.2

A* Ancamine 2423 formulated with standard Bisphenol-A (DGEBA, EEW=190) resin

B* Ancamine 2423 with 90% DGEBA resin (EEW=190) and 10% Epodil 748 diluent (C₁₂-C₁₄ alkyl glycidyl ether)

SUPPLEMENTARY DATA

CHEMICAL RESISTANCE

Chemical immersion studies following ASTM D543 were performed on coupons using standard Bisphenol-A (DGEBA, EEW=190) resin cured with Ancamine 2423 curing agent for 7 days at 77°F. Three samples were tested for each reagent. Table 4 shows the average percentage weight change after 3 days, 7 days and 28 days in various chemicals at 77°F.

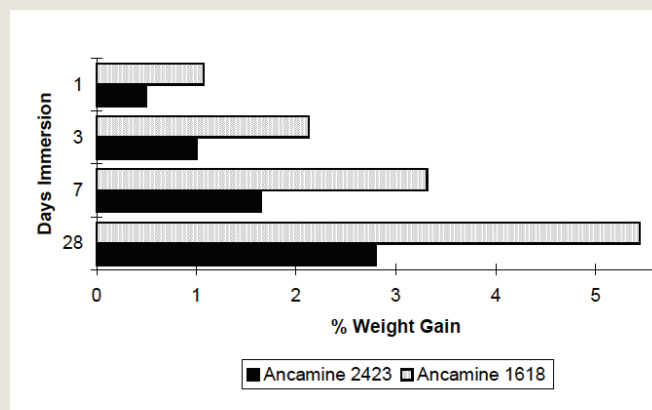
Spillage resistance studies were conducted on Ancamine 2423 curing agent formulated with a 90% DGEBA resin (EEW=190) and 10% Epodil 748 diluent (C12-C14 alkyl glycidyl ether) blend. Samples were cured for 7 days at 77°F; three samples were tested for each reagent. The immersion/recovery schedule for the testing is shown in Table 5. 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. Results of this study are presented in Table 6.

These studies show that Ancamine 2423 curing agent imparts outstanding chemical resistance to organic acids. Figure 1 compares the 10% acetic acid resistance of Ancamine 2423 with Ancamine 1618, a standard cycloaliphatic curing agent,

when cured with a 90% DGEBA resin (EEW=190) and 10% Epodil 748 diluent blend. The organic acid resistance imparted by Ancamine 2423 curing agent makes it particularly useful in formulating materials for use in food processing plants and food preparation areas.

The chemical resistance of Ancamine 2423-cured formulations can be optimized for specific chemicals using different resin blends, such as DGEBA and multifunctional novolac resins. For information on chemical resistance of many other Evonik cycloaliphatic curing agents, please refer to “Chemical Resistance for Ambient Cure Epoxy Formulations”.

FIGURE 1: 10% ACETIC ACID RESISTANCE



**TABLE 4: CHEMICAL RESISTANCE FOR ANCAMINE 2423 FORMULATION
% WEIGHT CHANGE AS A FUNCTION OF TIME - CONTINUOUS IMMERSION**

Reagent	Ancamine 2423/DGEBA Resin		
	After 3 days % wt. change	After 7 days % wt. change	After 28 days % wt. change
Deionized Water	0.31	0.50	1.12
Methanol	D @ 3 days	—	—
Ethanol	6.57	10.10	D @ 14 days
Toluene	1.32	3.99	19.20
Xylene	0.08	0.36	1.52
Butyl Cellosolve	4.12	6.76	13.78
Methyl Ethyl Ketone	D @ 1 day	—	—
10% Lactic Acid	0.50	0.82	1.70
10% Acetic Acid	0.90	1.44	2.85
70% Sulfuric Acid	0.04	0.06	0.11
98% Sulfuric Acid	D @ 1 day	—	—
50% Sodium Hydroxide	-0.04	-0.04	-0.02
Bleach	0.11	0.29	0.78
Trichloroethane	0.59	1.63	5.74
Skydrol	1.33	2.37	4.9
10% Nitric Acid	0.42	0.69	1.50

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

TABLE 5: SPILLAGE RESISTANCE TEST METHOD SCHEDULE

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

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

**TABLE 6: SPILLAGE RESISTANCE FOR ANCAMINE 2423 WITH 90% DGEBA / 10% EPODIL 748
 % WEIGHT CHANGE AND SHORE D HARDNESS AS A FUNCTION OF TIME**

Reagent	Initial	After 3 hr		After 24 hr		After 3 days		After 7 days		After 28 days		
	Hard	% wt	Hard	% wt	Hard	% wt	Hard	% wt	Hard	% wt	Hard	
10% Acetic Acid	83	0.13	82	0.50	81	1.00	79	1.65	78	2.80	77	
10% Lactic Acid	83	0.09	83	0.32	82	0.63	81	1.01	80	1.70	79	
Toluene	83	0.38	82	5.45	67	14.65	42	20.66	34	Destroyed		
Xylene	83	-0.06	81	0.57	80	2.37	74	4.80	67	15.5	45	
Trichloroethane	83	0.05	81	0.25	82	1.18	81	3.30	80	9.45	72	
Methanol	83	3.02	66	9.55	35	Destroyed						
Ethanol	83	1.31	75	4.55	60	8.76	40	12.3	30	Destroyed		
Butyl Cellosolve	83	0.71	78	3.36	71	7.30	61	12.25	47	24.5	25	
Methyl Ethyl Ketone	83	8.30	53	Destroyed								
Skydrol	83	0.17	81	0.69	81	1.83	79	3.10	76	5.60	73	
70% Sulfuric Acid	83	0.04	83	0.10	83	0.11	82	0.10	82	0.11	82	
98% Sulfuric Acid	83	-20.0	73	Destroyed								
Deionized Water	83	0.24	82	0.21	82	0.46	81	0.75	78	1.32	81	
50% Sodium Hydroxide	83	0.01	83	0.00	83	0.05	83	-0.03	82	-0.04	83	
Bleach	83	0.05	83	0.20	82	0.41	80	0.65	80	1.05	80	

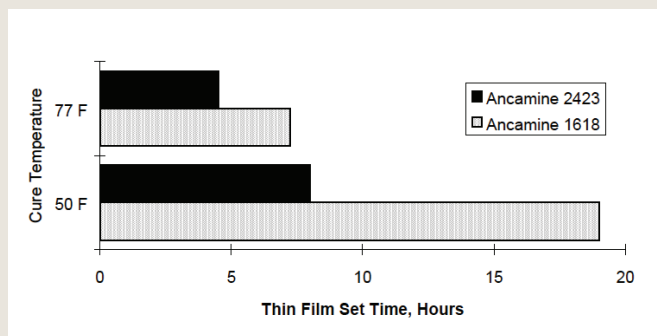
Note: Cured for 7 days at 77°F.

CURE SPEED

The thin film set time of Ancamine 2423 curing agent with DGEBA resin in a 3 mil film is 3.5 hours at 77°F and 7.0 hours at 50°F. Using a 90% DGEBA resin/10% Epodil 748 diluent blend, the thin film set time is 4.5 hours at 77°F and 8.0 hours at 50°F. Thin film cure speed is faster than with most cycloaliphatic curing agents such as Ancamine 1618. Figure 2 shows the thin film set time of Ancamine 2423 versus Ancamine 1618 with a 90% DGEBA resin/10% Epodil 748 diluent blend at 77°F and 50°F.

To speed up thin film set time and hardness development at ambient temperatures, Ancamine 2423 curing agent can be accelerated with aliphatic amine curing agents such as 10% Ancamine 2089M, 10% Ancamine 1768 or 10% Ancamine 2205. 10% Ancamine 2089M curing agent is recommended for low temperature (< 55°F) acceleration.

FIGURE 2: THIN FILM SET TIME COMPARISON



HARDNESS DEVELOPMENT

Gel time and thin film set time define well the development of cure, but often do not accurately predict development of hardness. König Pendulum Hardness was measured as a function of cure time at 77°F and 50°F for 10 mil coatings formulated with Ancamine 2423 curing agent and DGEBA resin. Shore D hardness development was also measured as a function of 77°F and 40°F cure for a 3-inch diameter by 1/4-inch thick casting. Results are presented in Table 7.

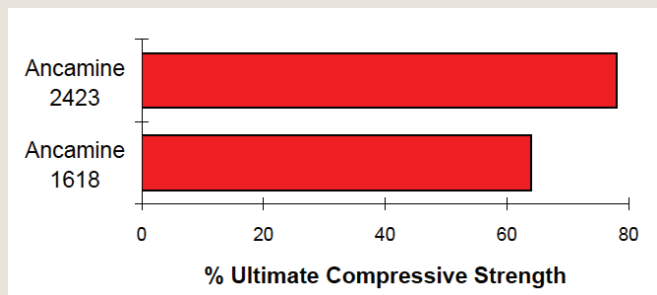
TABLE 7: ANCAMINE 2423 HARDNESS DEVELOPMENT

Number of Days Cure	1	3	7
77 °F Cure König Pendulum Hardness	90	114	117
50 °F Cure König Pendulum Hardness	20	94	112
77 °F Cure Shore D Hardness ¹³	81	84	84
40 °F Cure Shore D Hardness ¹³	<10	60	81

Note: Ancamine 2423 was formulated with DGEBA (EEW=190) resin.

Property development is faster than with most cycloaliphatic curing agents such as Ancamine 1618. Figure 3 shows the strength development of a self-leveling floor formulation containing Ancamine 2423 curing agent versus that containing Ancamine 1618 when cured at 77°F.

FIGURE 3: 24 HR COMPRESSIVE STRENGTH DEVELOPMENT



WATERSPOT RESISTANCE

Ancamine 2423 curing agent formulated with a 90% DGEBA resin (EEW=190) and 10% Epodil 748 diluent (C₁₂-C₁₄ alkyl glycidyl ether) blend was tested for waterspot resistance. A 10 mil film was cured for eight hours at 72°F and 55% relative humidity. After eight hours, a cotton ball saturated with water was placed on the film. The film was then placed in an incubator for 24 hours at 72°F and 90% relative humidity. After this period, the film was examined for white spots. The Ancamine 2423 formulation showed an absence of spots, indicating good waterspot resistance at ambient conditions.

Footnotes

- (1) ASTM D 1544-80
- (2) ASTM D-445-83, Brookfield, RVTD, Spindle 4
- (3) ASTM D 1475-85
- (4) Perchloric Acid Titration
- (5) Seta Flash Closed Cup
- (6) Techne GT-4 Gelation Timer
- (7) BK Drying Recorder
- (8) ASTM D 2471-71
- (9) ASTM D 3418-82
- (10) ASTM D 695-85
- (11) ASTM D 638-86
- (12) ASTM D 790-86
- (13) ASTM D 2240-86
- (14) ASTM D 523-85
- (15) ASTM D 4060-90

Epoxy Curing Agents and Modifiers

ANCAMINE® 2423 Curing Agent

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