Epoxy Curing Agents and Modifiers

ANCAMINE® 2286 Curing Agent

DESCRIPTION

Ancamine 2286 is a very low viscosity modified cycloaliphatic amine curing agent intended for ambient or low temperature cure of liquid epoxy resins. Its low viscosity makes it especially suitable for heavily filled systems.

ADVANTAGES

- Very low viscosity
- Good chemical resistance (see followingtables)
- Low color

APPLICATIONS

- Self-leveling flooring
- Mortars and concrete repair materials
- High-solids coatings
- Concrete sealers

STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamine 2286 curing agent.

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.

TYPICAL CURE SCHEDULE

2 to 7 days at ambient temperature.

TABLE 1: TYPICAL PROPERTIES

Appearance	Water-White Liquid
Color (Gardner)	1
Viscosity @ 77°F (cP)	60
Amine Value (mg KOH/g)	325
Specific Gravity @ 77°F	1.01
Density (lb/gal) @ 77°F	8.4
Flash Point (°C)	100
Recommended Use Level (phr, EEW=190)	50

TABLE 2: TYPICAL HANDLING PROPERTIES

	A*	B*
Use Level (Phr)	50	49
Mixed Viscosity @ 77°F (Cp)	—	520
Gel Time (150G Mix @ 77°F) (Min)	40	55
Thin Film Set Time		
@ 77°F (HR)	6	10.5
@ 50°F (HR)	—	21
Peak Exotherm (100G Mix @ 77°F) (°F)	280	—
Peak Exotherm Time (Min)	60	—

TABLE 3: TYPICAL PERFORMANCE (7 DAY CURE @ 77°F)

	B*
Glass Transition Temperature (°F)	113
Compressive Strength @ Yield (psi)	11,400
Compressive Modulus (thousand psi)	367
TENSILE STRENGTH (PSI)	7,400
Tensile Modulus (thousand psi)	191
Tensile Elongation (%)	5.7
Flexural Strength (psi)	11,800
Flexural Modulus (thousand psi)	431
Hardness (Shore D)	82
Abrasion Resistance Weight Loss @ 1,000 cycles with wheel no. 10 (gm)	0.039
Mar Resistance (kg)	1.30

* Ancamine 2286 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=190) epoxy resin.

* Ancamine 2286 curing agent with 90% DGEBA resin (EEW=190) and and 10% Epodil® 748 diluent (C_{12}–C_{14} alkyl glycidyl ether).

SUPPLEMENTAL DATA

CHEMICAL RESISTANCE: Chemical immersion studies following ASTM D543 were performed using Ancamine 2286 formulations cured for 7 days at 77°F. Ancamine 2286 curing agent was mixed in the recommended use levels with the following resins:

100% Bisphenol-A based liquid resin (EEW=190)
100% Bisphenol-F based liquid resin (EEW=172)
60 % Bisphenol-F (EEW=172) / 40% multifunctional epoxy novolac (EEW=176) resin blend
10% Cresyl glycidyl ether (CGE - Epodil 742) dilutedBisphenol-A resin (EEW=188)

Three samples were tested for each reagent. Table 1shows the percent weight gain or loss after 3 days and 28 days for each of these formulations immersed invarious chemicals at 77°F

TABLE 1: CHEMICAL RESISTANCE FOR ANCAMINE 2286 FORMULATIONS % WEIGHT CHANGE AS A FUNCTION OF TIME

Reagent	with Bis-A Based Resin (EEW=190)		with Bis-F Based Resin (EEW=172)		with 60% Bis-F / 40% Novolac Blend		with 10% CGE Diluted Bis-A Resin	
	3 days	28 days	3 days	28 days	3 days	28 days	3 days	28 days
Deionized Water	0.52	1.51	0.48	1.63	0.53	1.69	0.45	1.51
Methanol	11.74	5.07	12.26	Dest.	11.97	2.50	14.29	5.90
Ethanol	3.76	10.35	3.37	9.22	3.03	8.70	4.62	12.08
Toluene	0.44	2.12	0.07	0.37	0.07	0.61	0.29	2.75
Xylene	0.04	0.18	0.04	0.09	-0.01	0.09	0.03	0.19
Butyl Cellosolve	2.02	5.86	1.05	3.30	0.84	2.92	2.36	8.92
MEK	Dest.	Dest.	19.28	Dest.	20.00	11.75	Dest	Dest.
10% Lactic Acid	2.20	6.55	2.84	8.05	3.24	8.70	1.87	6.01
10% Acetic Acid	3.32	9.27	3.85	10.77	4.50	12.69	2.90	8.68
70% Sulfuric Acid	0.11	0.05	0.17	0.44	0.18	0.65	0.16	0.16
98% Sulfuric Acid	Dest.	Dest.	1.53	-9.75	0.58	-4.46	Dest.	Dest.
50% Sodium Hydroxide	0.64	0.54	0.03	0.02	-0.02	-0.04	0.00	-0.03
10% Sodium Hypochlorite	0.47	1.22	0.50	1.27	0.56	1.48	0.39	1.25
1,1,1 Trichloriethane	0.02	0.23	-0.01	0.12	0.04	0.24	0.03	0.47

Dest. = Samples destroyed

Spillage resistance studies were conducted on Ancamine 2286 curing agent formulated with a 90% bis-A 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 2. 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 3.

TABLE 2: 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 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 3: SPILLAGE RESISTANCE FOR ANCAMINE 1618 WITH 90% DGEBA / 10% EPODIL 748 % WEIGHT CHANGE AND SHORE D HARDNESS AS A FUNCTION OF TIME

Reagent	Initial Hard.	After 3 hr		After 24 hr		After 3 days		After 7 days		After 28 days		After 90 days	
		% wt.	Hard	% wt.	Hard	% wt.	Hard	% wt.	Hard	% wt.	Hard	% wt.	Hard
10% Acetic Acid	82	0.62	80	1.70	75	3.24	69	4.99	65	8.30	65	12.4	58
10% Lactic Acid	82	0.46	81	1.35	79	2.59	77	3.94	76	6.38	73	9.65	63
Toluene	82	0.02	80	0.80	75	3.01	68	6.43	56	19.39	50	12.69	57
Xylene	82	0.01	80	0.06	76	0.31	75	1.10	70	4.61	72	NM	NM
Trichloroethane	82	0.04	79	0.39	78	1.67	75	3.86	70	13.95	67	38.81	53
Methanol	82	3.23	65	8.47	34	11.09	22	DESTROYED					
Ethanol	82	0.94	75	2.78	62	5.33	48	8.20	44	8.21	49	5.67	60
Butyl Cellosolve	82	0.28	78	1.12	72	3.34	68	5.74	57	11.72	55	25.51	36
Methyl Ethyl Ketone	82	5.65	64	DESTROYED									
Skydrol	82	0.06	77	0.27	74	0.80	73	1.49	70	2.59	76	3.99	63
70% Sulfuric Acid	82	0.17	83	0.11	82	0.16	82	0.20	82	0.20	81	0.21	81
98% Sulfuric Acid	82	-12.35	80	DESTROYED									
Deionized Water	82	0.17	82	0.31	82	0.58	82	0.99	82	1.77	80	1.91	80
50% Sodium Hydroxide	82	0.08	80	-0.06	79	-0.05	79	-0.05	79	-0.08	80	-0.15	58
Bleach	82	0.11	83	0.30	82	0.55	80	0.89	80	1.32	80	1.76	68

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

These studies show that Ancamine 2286 curing agent provides good resistance to a variety of chemcials. Compared with most curing agents, Ancamine 2286 provides very good resistance to solvents. Chemical resistance of 2286-based formulations can be optimized for specific chemicals using different resin blends. For information on the chemical resistance of many other Air Products curing agents, please refer to publication number 125-9326 (Rev 1996): "Chemical Resistance for Ambient Cure Epoxy Formulations."

CURE SPEED: The thin film set time of Ancamine 2286 curing agent with standard bisphenol-A resin (DGEBA, EEW=190) in a 6 mil film is 6.0 hours at 77°F. Using a 90% bisphenol-A resin/10% Epodil 748 diluent blend, the thin film set time is 10.5 hours at 77°F and 21 hours at 50°F. To speed thin film set time and hardness development, Ancamine 2286 can be acceleratedwith modified aliphatic amine curing agents such as 10% Ancamine 2089M, 10% Ancamine 2432, or 10% Ancamine 2481.

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