Product information

ANQUAMINE™ 360

Curing Agent

DESCRIPTION

Anquamine 360 curing agent is a modified polyamide curing agent designed for use with liquid epoxy resins in twocomponent, ambient-cure, waterborne epoxy coatings. It is supplied at 50% solids in water, allowing for the formulation of very low or zero-VOC epoxy coatings with handling and performance properties typical of solvent borne formulations.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Clear Amber Liquid		
Color	<16	Gardner	
Viscosity @ 25°C	30,000-50,000	cP	
Amine Value	210	mg KOH/g	
Equivalent Wt/{H}	280		
Recommended Use Level	100-150	phr	EEW=190
Density	8.75	lb/gal	
Specific Gravity @ 25°C	1.05		
Solids Content	49-50	%	
Solvent	Water		

STORAGE AND HANDLING

Refer to the Safety Data Sheet on Anquamine 360 curing Agent.

SHELF LIFE

At least 24 months from the date of manufacture in the original sealed container at ambient temperature. Store away from heat and humidity in tightly closed containers.

TYPICAL CURE SCHEDULE

7 to 10 days at ambient temperature.

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APPLICATIONS

• Concrete floor and wall coatings
• Concrete sealers and primers

Anquamine 360 curing agent is used primarily in waterborne epoxy coatings applied to cementitious substrates. Anquamine 360 based coatings develop high adhesion to damp concrete with bond strengths greater than 250 psi and typical bond failure in the concrete substrate.

The coatings may be clear primers for sealing porous concrete, pigmented enamels for stain and chemical resistance or anti-skid coatings for increased safety in traffic areas.

Paints made with Anquamine 360 curing agent are very low-odor and nonflammable. They are suitable for solventsensitive areas such as schools, hospitals, nursing homes and veterinarian offices.

Anquamine 360 curing agent is USDA-approved for indirect food contact. The cured coatings can be cleaned repeatedly with hot water and detergent, making them suitable for use in dairies, breweries and other food processing facilities.

Cured coatings based on Anquamine 360 curing agent can also be wiped repeatedly with strong solvents without loss of gloss or hardness. The material makes effective anti-graffiti paints for use in subways and other public access areas.

TYPICAL HANDLING PROPERTIES*

Property	Value	Unit	Method
Pot Life @ 77°F	1-2	h	
Set to Touch	6	h	
Hard Dry	12	h	
Gloss, 60°	90		
Pencil Hardness	2H		

* Anquamine 360 curing agent formulated with Standard Bisphenol-A (DGEBA) based epoxy resin modified with C12-14 mono glycidyl ether (EEW=200).

CHEMICAL RESISTANCE

In chemical resistance studies, a standard solvent-based epoxy/ polyamide coating was compared with a waterborne epoxy coating based on Anquamine 360 curing agent (Table 1). After 12 weeks exposure to 10% sulfuric acid, the waterborne coating cured with Anquamine 360 curing agent blistered only very slightly, while the standard solvent-based epoxy/polyamide failed completely. Resistance of the waterborne coating to xylene was also slightly better. In general, the resistance of waterborne modified polyamide/ epoxy coatings is very good to seawater, distilled water, sodium hydroxide, vegetable oils, crude oil, antifreeze, Skydrol and xylene. Resistance to inorganic acids is moderate but typical of most epoxy coatings. Resistance to organic acids is poor.

TABLE 1: CHEMICAL RESISTANCE OF EPOXY COATINGS BASED ON ANQUAMINE 360 VERSUS A STANDARD POLYAMIDE

Reagent	Exposure Time (weeks)	Anquamine 360	Ancamide® 220 System B
Sea Water	6	No Attack	No Attack
	8	No Attack	No Attack
	10	No Attack	No Attack
	12	Moderate Discoloration	No Attack
10% NaOH	6	No Attack	No Attack
	8	No Attack	No Attack
	10	No Attack	No Attack
	12	No Attack	No Attack
10% H_2SO_4	6	No Attack	Slight Blistering
	8	No Attack	Slight Blistering
	10	Very Slight Blistering	Severe Blistering
	12	Very Slight Blistering	
Xylene	6	No Attack	No Attack
	8	No Attack	No Attack
	10	No Attack	Moderate Discoloration
	12	No Attack	Moderate Discoloration

Anquamine 360 System:

112 parts Anquamine 360
71.5 parts DGEBA (EEW=190)
2.85 parts Epodil® 742
188 parts Water

Ancamide 220 System:

34 parts Ancamide 220
26 parts Isopropanol
26 parts Toluene
100 parts DER 661
50 parts Methyl Iso-Butyl Ketone
50 parts Xylene

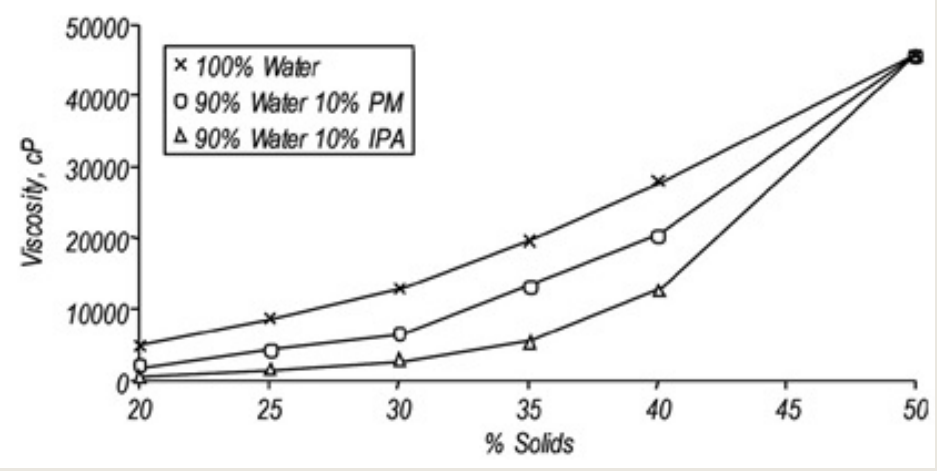
APPLICATION

1. 6“ x 4“ mild steel. Shot blasted panels.
2. All panels were primed with conventional 2-pack zinc richepoxy and allowed to cure for 24 hours.
3. Two coats of each system were applied, allowing not morethan 18 hours between coats.
4. The panels were immersed in reagents after a 7 day cure ofthe final coat.

FORMULATING GUIDELINES

CURING AGENT PREPARATION: When formulated for use, Anquamine 360 curing agent is thinned from 50% solids to 20% solids with water. (Tap water is acceptable provided it is low in dissolved salts.) When diluted, the viscosity drops from 45,000 cP to 5,000 cP, as shown in Figure 1 (If over diluted with water, the curing agent will develop a heavy haze and the cured coatings may exhibit low gloss.) Curing agent viscosity and solids can be further reduced by adding small amounts of co-solvent as shown in Figure 1. The viscosities of the formulated A and B portions of the paint should be at least 1,000 cP to ensure good shear when the two are mixed. (If the viscosities are too low, the epoxy will not emulsify properly.)

FIGURE 1: ANQUAMINE 360 DILUTION CURVE



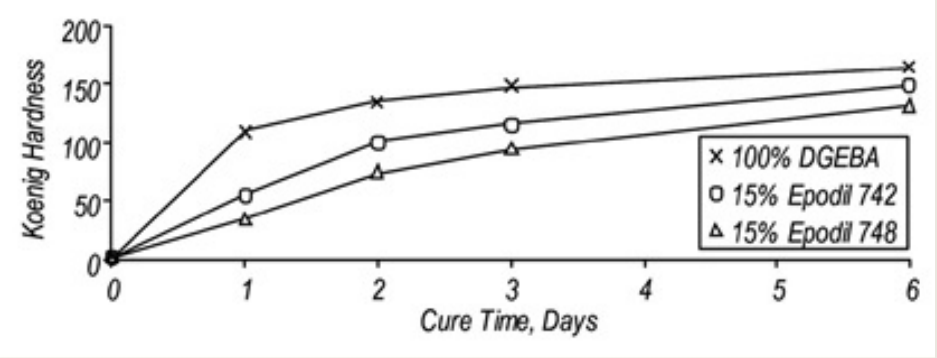
CO-SOLVENTS: Isopropyl alcohol or PM solvent may be added to further reduce curing agent viscosity, to reduce solids below 20% and to improve solution stability. Typical solvent levels are 10–20% based on the curing agent weight. Co-solvents also assist in water evaporation and film coalescence.

Dilute acetic acid (5% in water) or distilled white vinegar may be added at low levels (5–10% based on Anquamine 360 curing agent weight) to reduce viscosity, improve solution stability and extend pot life. Note: High levels of acetic acid may cause water sensitivity and eye irritation during application.

CURING AGENT USE LEVEL: The recommended use level for Anquamine 360 curing agent is 100–150 phr with liquid epoxy resin (DGEBA EEW=190). Water resistance is optimal at the 100 phr loading, and solvent resistance is optimal at the 150 phr loading. Dry time is faster at the 150 phr loading. When using diluted epoxy resins, the use level should be altered to reflect the change in epoxy equivalent weight.

EPOXY RESINS: Anquamine 360 curing agent can be used with Bisphenol A epoxy resin (EEW=190), with Bisphenol F epoxy resin or with diluted epoxies. Aliphatic diluents such as Epodil 748 or aromatic diluents such as Epodil 742 may also be used. Figure 2 illustrates the effects of diluents on hardness development.

FIGURE 2: ANQUAMINE 360 HARDNESS DEVELOPMENT



EPOXY EMULSIONS: Anquamine 360 curing agent may also be used with liquid epoxy emulsions (use with solid epoxy emulsions is not recommended) allowing the formulation of 1:1 package ratios. In these systems, the liquid epoxy is pre-mixed with a surfactant, then water is added slowly under high shear, as described in Formulation 3.

ADDITIVES: Use of pigment wetting agents and defoamers is recommended for optimal performance. See the starting point formulations for examples.

PIGMENTS: Avoid the use of calcium carbonate as this material interferes with the salting mechanism of the curing agent. Weather able grades of TiO_2, such as TiPure™ R 960, are preferred for yellowing resistance and consistent rheology. Low oil absorption talc is recommended when gloss reduction and improved water resistance are desired.

TINTS: Universal tints may be used with Anquamine 360 curing agent formulations. The tints should always be added to the epoxy side of the formulation prior to mixing with the curing agent. When adding tints to liquid epoxy, Daniels Products UL tints are recommended. When adding tints to epoxy emulsions, Daniels Products WD tints are recommended.

PAINT PREPARATION: Anquamine 360 curing agent-based paints should be well mixed prior to application to ensure complete emulsification of the epoxy resin. Mechanical mix- ing, such as with an electric drill or a jiffy mixer, is recom- mended. High-speed dispersion is not necessary.

APPLICATION: Anquamine 360 curing agent-based paints are typically applied by brush or roller. For spray application, the paint should be thinned with a mixture of water and co-solvent such as 9:1 water:IPA. The wet film thickness should be a maximum of 8–10 mils to allow for water evaporation. Under normal curing conditions, the paint can be recoated in 6–8 hours.

CURING CONDITIONS: Anquamine 360 curing agent-based paints should be cured at >50°F and <80% relative humidity. Good air circulation over the drying film will ensure good water evaporation.

STARTING POINT FORMULATION 1 CLEAR CONCRETE PRIMER

Part A	Pounds	Supplier	Gallons
Liquid Epoxy[1]	150.64		15.53
Epodil 748	33.08	Evonik	4.47
Totals	**183.72**		**20.00**
Part B			
Anquamine 360	275.70	Evonik	31.69
Water	401.51		48.20
Defoamer[2]	.88	Evonik	0.11
Totals	**678.09**		**80.00**

Wt. Solids (%)	37.4	60° Gloss	90
Volume Solids (%)	35.3	Dry Time	
VOC	0	Tack Free (h)	6
		Dry (h)	12

(1) Dow DER 331 or equivalent
(2) Surfynol® DF-62 or equivalent

STARTING POINT FORMULATION 2 GLOSS WHITE ENAMEL

Part A	Pounds	Supplier	Gallons
Liquid Epoxy[1]	188.3		19.41
Epodil 748	21.8	Evonik	2.95
Isopropyl Alcohol	17.3		2.64
Color Tint[2]			
Totals	**227.4**		**25.00**
Part B			
Anquamine 360	315.7	Evonik	36.29
Pigment[3]	162.5		4.88
Wetting Agent[4]	4.8	Evonik	0.60
Isopropanol Alcohol	33.7		5.16
PM Solvent	13.9		1.85
Defoamer[2]	4.6	Evonik	0.55
Water	213.8		25.67
Totals	**749.0**		**80.00**

PVC (%)	11	Dry Time	
Weight Solids (%)	51.2	Tack Free (h)	6
Volume Solids (%)	43.9	Hard Dry (h)	12
VOC, lb/gal	1.2		

(1) Dow DER 331 or similar DGEBA epoxy
(2) Daniels UL Tint or equivalent
(3) TiPure R960 or equivalent
(4) Surfynol® CT-111 or equivalent
(5) Surfynol DF-110D or equivalent

STARTING POINT FORMULATION 3 EPOXY EMULSION ENAMEL

Part A	Pounds	Gallons
Epoxy[1]	77.98	8.05
Epoxy[2]	156.90	16.49
Surfactant[3]	7.99	0.96
Pigment[4]	181.85	5.59
Defoamer[5]	5.0	0.60
PM Solvent	21.98	2.88
Water	33.08	4.47
Color Tint[6]		
Totals	**580.59**	**50.00**
Part B		
Anquamine 360	351.71	40.13
Isopropanol Alcohol	41.96	6.39
Water	28.98	3.47
Totals	**422.65**	**50.00**

(1) Dow DER 331 or equivalent
(2) Dow DER 324 or equivalent
(3) Synthron E 23-191, Igepal CO 897, or equivalent
(4) TiPure R960 or equivalent
(5) Surfynol DF-62, Byk 034, or equivalent
(6) Daniels WD Color Tint or equivalent

PREPARATION OF EPOXY EMULSION: First, pre-mix the epoxy resin, surfactant, defoamer, solvent and pigment in a high- speed dispersator, then slowly add water. Do not pre-heat the components.

When approximately 25% of the water has been added, the batch will pass through an oil-water inversion where the vis- cosity will increase sharply and the batch will have a grainy appearance. Continue adding the water slowly. The viscosity will drop rapidly as the system enters the continuous phase. Maintain the temperature below 150°F during the dispersion process.

Continue adding the water slowly until the change is com- plete; then stop the dispersator. Note: Excessive dispersion or heat buildup may break the emulsion.

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