

ANQUAMINE[®] 419

Curing Agent

DESCRIPTION

Anquamine 419 waterborne curing agent is a modified aliphatic amine supplied at 60% solids in water and methoxy propanol. It is intended for use with waterborne epoxy dispersions in two-component, ambient-cure, waterborne epoxy coatings. Anquamine 419 curing agent delivers excellent properties in anticorrosive primers, white gloss enamels and clear coats. It can be used with different solid epoxy resin dispersions depending upon the properties desired.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Amber Liquid		
Color	7	Gardner	ASTM D 1544-80
Viscosity @ 77°F	8,000-14,000	cP	Brookfield, ASTM D 445-83, spindle 4
Specific Gravity @ 77°F	1.085		ASTM D 1475-85
Density	9.04		
Flash Point	122	°F	Seta Flash Closed Cup
AHEW	284		theoretical, as supplied
Nonvolatile	60	%	
Volatiles: Water	15	%	
1-methoxy-2-propanol	25	%	

ADVANTAGES

- Excellent corrosion resistance
- Rapid dry time
- Excellent adhesion to steel
- Good color and gloss
- Good stain resistance
- Low odor

APPLICATIONS

- Industrial maintenance and marine primers and topcoats
- General metal primers
- Transportation primers

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 Anquamine 419 curing agent.

USE LEVELS PHR (BASED ON SOLIDS)

Property	Value	Unit	Method
Solid Epoxy Resin (EEW=530)	20–32		60–0% excess resin
Solid Epoxy Resin (EEW=630)	14–27		90–0% excess resin
Solid Epoxy Dispersion (Ancarez AR550)	25-30		

SUPPLEMENTARY DATA

Anquamine[®] 419 is specifically designed for use with solid epoxy resin dispersions. As illustrated below, several different epoxy resin dispersions can be used depending on the properties desired and the end-use application. In combination with Anquamine[®] 419 all resin dispersions tested offer good anti-corrosion performance. We will describe more detailed results using the combination of Anquamine[®] 419 and Ancarez[®] AR 555

FORMULATING GUIDELINES: Anquamine[®] 419 curing Agent can be utilized with a variety of solid epoxy resin dispersions to produce corrosion resistant primers or high gloss enamels for a variety of end user requirements. For development of optimum coating performance, the following formulation guidelines should be employed whenever possible.

STOICHIOMETRY: Using an excess of epoxy resin is recommended in order to provide the balance of properties — maximum hydrophobicity accompanied by hardness and solvent resistance — which are the desired properties for primers and topcoats. If increased chemical resistance is required, reducing the level of excess epoxy resin is recommended. However this is likely to have an adverse effect on the water resistance of the coatings. Using a range of 60-90% excess epoxy is recommended for maximum corrosion resistance. Table 3 below summarizes the positive influences of changing the stoichiometric ratio of curing Agent and epoxy resin.

TABLE 3: POSITIVE INFLUENCES OF CHANGING THE STOICHIOMETRY

Increase in Epoxy Resin	Increase in Curing Agent
Pot Life	Dry Speed
Salt Fog Resistance	Stain Resistance
Humidity Resistance	Solvent Resistance
Water Resistance	Higher Gloss
Alkali Resistance	Flexibility
Acid Resistance	Abrasion Resistance

COALESCING AGENTS: The use of coalescing agents is critical for optimum coating compatibility and film Formation under a wide range of cure conditions and greatly Impacts the aesthetic and performance parameters of the coating. A combination of hydrophobic and hydrophilic solvents are typically recommended to assist in keeping the film open longer and promoting water release. Recommendations for hydrophobic coalescing agents, which remain in the film and aid, flow, air release and open time are benzyl alcohol, ethylene glycol phenyl ether (EPH) and propylene glycol phenyl ether (PPH). For hydrophilic agents which promote water release from the film, PM solvent, ethylene glycol propyl ether (EP) and propylene glycol propyl ether (PnP) are recommended. Typical hydrophobic solvent levels are 3% based on system resin solids.

PIGMENTS AND PIGMENT DISPERSION: Anquamine 419 is an excellent pigment dispersant. Its excellent inherent pigment wetting and its high dilutability make it an ideal vehicle for pigmentation. If Anquamine 419 is pigmented it is recommended that co-solvents are added to the curing agent prior to addition of extra water to aid viscosity reduction. Epoxy resin dispersions may also be pigmented, offering good formulating latitude. During the pigmentation process, System stability and ease of mixing pigmented resin and curing Agent components are greatly enhanced by incorporation of a pigment wetting agent. The optimum level is dependent upon the PVC and the oil absorption of the pigments used in the paint formulation. Suitable wetting agents include Disperbyk 190 and Surfynol CT-111. The recommended addition level is in the 1-3% range based on total pigment weight. Typical PVC levels for the primers and gloss enamels are 35% and 15-20% respectively.

FLASH RUST: Water-based primers may present flash-rust when applied over sandblasted steel, to eliminate this phenomenon we recommend small additions of flash-rust inhibitors and excellent results were obtained adding a 10% aqueous solution of sodium nitrite (NaNO₂) in the amount of 2 pounds of solution per 100 gallons of paint (or around 1.2% by weight).

MIXING AND APPLICATION: Thoroughly mix the A and B side components for 1-2 minutes until a uniform consistency is achieved. For high-gloss finishes, no induction time is needed. However, for maximum humidity and corrosion resistance, allow the mixed paint to induct for 15-30 minutes. For conventional spray, the mixed paint can be reduced to application viscosity with water. Good air flow across freshly painted areas will assist in water evaporation and improve dry speed. Typical pot life is 3-6 hours. In gloss enamels, end of pot life is signaled by a visible loss of gloss in the dried film. Paint remains fluid beyond the pot life but loses coalescence and should be discarded. Do not mix expired paint with fresh paint.

CLEAN UP: Application tools can be cleaned with warm soap and water.



CORROSION RESISTANT PRIMER FORMULATIONS

Preliminary starting point formulation WB 419P1 is a fast drying anti-corrosive primer based on Anquamine 419 and Ancarez AR555.

TABLE 4: FAST DRYING WATERBORNE METAL PRIMER (WB 419P1)

Nb.	Part A	Weight	Type	Supplier
1.	Anquamine 419	7.83	Curing Agent	Evonik
2.	Talc #400	6.71	Filler	
3.	Barite #500	6.70	Filler	
4.	TiO ₂	6.76	Pigment	
5.	Halox SZW-111	4.25	Pigment	Halox
6.	Mica #325	0.79	Filler	
7.	Quartz #400	14.47	Filler	
8.	Water	12.97	Solvent	
9.	PM Solvent	2.75	Solvent	
10.	Glacial Acetic	0.14	Additive	
11.	NaNO ₂ (10% in H ₂ O)	0.12	Additive	
12.	Surfynol DF62	0.09	Additive	Evonik
Nb.	Part B		Type	Supplier
1.	Ancarez AR555	35.83	Resin	
	Total A and B	100		

Mixing Ratio	Volume A:B	1.4:1
Density (g/mL)	Mix	1.26
Solid Content (Weight %)	Mix	64.92
Solid Content (Volume %)	Mix	55.63
PVC		37.40
Epoxy/Amine		1.00
VOC	g/L	62

CORROSION RESISTANCE: Formulation WB 419P1, based on Anquamine 419 and Ancarez AR555, was evaluated for salt spray (ASTM B117) and salt water immersion (3.5% NaCl in water). The results obtained are presented in Table 5 and also on the pictures. Following 1000 hrs. salt fog exposure, formulation WB 419P1 exhibit excellent resistance.

TABLE 5: SALT SPRAY RESISTANCE AND SALT WATER RESISTANCE WB 491P1 [1000 HRS.]

Formulation	Scribe Creep	Field Blistering	Blister Size
Salt Spray	10	10	10
Salt Water Immersion	10	10	10

5% salt spray, cabinet temperature 35 °C—ASTM B-117,
 film thickness 100 µm Rating: 10 = Best (no blisters), 0 = Worst

SALT SPRAY AND SALT WATER PANELS AFTER 1000 HRS. EXPOSURE

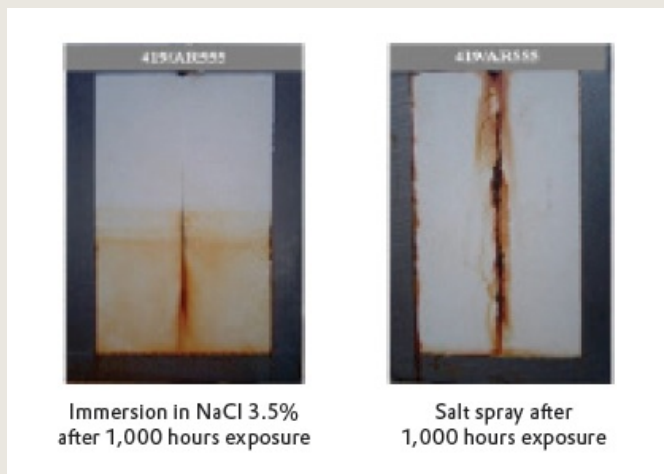


TABLE 6: ANQUAMINE 419 CURING AGENT LOW-VOC WATERBORNE METAL PRIMER STARTING POINT FORMULATION

Nb.	A SIDE	Pounds	Gallons	Supplier
1.	Water	109.47	13.12	
2.	Disperbyk 190	13.51	1.48	Byk Chemical
3.	Surfynol® DF 62	2.90	0.35	Evonik
4.	Surfynol 420	0.97	0.13	Evonik
Mix at slow speed, then add:				
5.	Red Iron Oxide	72.40	1.68	Bayer
6.	Zeospheres G400	62.74	2.59	3M
7.	Barytes	62.74	1.71	Cimbar
8.	Wollastocoat 10ES	62.74	2.59	NYCO
9.	Halox SW 111	96.53	4.00	Halox
10.	Mica 325	9.65	0.41	
11.	NaNO ₂ (10% in H ₂ O)	14.09	1.69	
High speed disperse to Hegman 6, reduce speed, then add:				
12.	Ancarez® AR555	415.08	45.62	Evonik
13.	Rheolate 310 (15% solution)	32.18	3.82	Elementis
		955.00	80.00	
Nb.	B SIDE	Pounds	Gallons	Supplier
1.	Anquamine 419	113.43	45.62	Evonik
2.	PM Solvent	32.82	3.75	
3.	De-ionized Water	31.08	3.72	
		177.33	20.00	

PERFORMANCE ATTRIBUTES

- Low VOC
- Low flammability
- Fast dry
- Long pot life
- Good corrosion resistance

FORMULATION PROPERTIES

VOC	1.14
Weight Solids (%)	60.53
Volume Solids (%)	46.74
PVC (%)	30
A Side Viscosity (KU)	56
B Side Viscosity (KU)	80
Mix Viscosity (KU)	1000
Pot Life (hr)	>6
Set-to-Touch (min)	15
Dry-to-Touch (min)	30
Hard Dry (hr)	4

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