Product information

ANCAMIDE® 2652

Curing Agent

DESCRIPTION

Ancamide 2652 curing agent is a special polyamide adduct designed for use with liquid epoxy resins in two-part, ambient-cure coatings specifically developed to provide long overcoatability with epoxy and alternative resin technology. Overcoatability of Ancamide 2652 curing agent based coatings with other epoxy systems can be as long as 6 months.

TYPICAL PROPERTIES

Property	Value	Unit	Method
Appearance	Clear, Amber Liquid		
Colour	8	Gardner	ASTM D 1544-80
Viscosity @ 25°C	2,000	mPa.s	ASTM D-445-83, Brookfield, RVTD, Spindle 4
Specific Gravity @ 25°C	0.98		ASTM D 1475-85
Amine Value	132	mg KOH/g	Perchloric Acid Titration
Solids	80	%	
Flash Point (closed cup)	37	°C	Seta Flash Closed Cup
Equivalent	250	Wt/{H}	
Recommended use Level	90-130	PHR	(EEW=190)

ADVANTAGES

- Long overcoatability
- Good corrosion resistance
- Fast dry and cure
- Moderate viscosity
- Good flexibility

APPLICATIONS

- High-solids marine and maintenance coatings
- High-solids lining coatings

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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.

PACKAGING AND HANDLING

Refer to the Safety Data Sheet for Ancamide 2652 curing agent.

TYPICAL HANDLING PROPERTIES*

Preferred loading of 90 phr (70% stoichiometry) for optimum overcoatability

Property	Value	Unit	Method
Use level	90	phr	
Thin Film Set Time Tack Free @ 25°C	5	h	BK Drying Recorder
Hard Dry @ 25°C	13	h	
Pencil Hardness @ 25°C	F		

TYPICAL PERFORMANCE PROPERTIES

Property	Value	Unit	Method
Use level	43	phr	White mid-coat made with LER 19% PVC
Anti-corrosive Properties Salt Spray	Good	1000h	ASTM B 117h
Overcoatability Epoxy on Epoxy	>3 Months		
Polyurethane on Epoxy	>3 Months		

*Ancamide 2652 curing agent formulated with LER (EEW=190) liquid epoxy resin.

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SUPPLEMENTARY INFORMATION

Ancamide 2652 curing agent is medium viscosity, modified polyamide solution supplied at 80% solids. When used with liquid epoxy resins, Ancamide 2652 curing agent offers good dry speed, excellent coating flexibility and long term corrosion resistance. Ancamide 2652 curing agent has the additional property of giving coatings exhibiting long term overcoatability. This means that coatings can be overcoated with epoxy technology without the issues of poor intercoat adhesion for up to 3 months after the initial coating has been applied. The product also allows for Ancamide 2652 based coatings to be overcoated with other coatings systems such as two component polyurethanes within a 3 month window. Ancamide 2652 curing agent also has a low level of free, unreacted amine, which reduces curing agent corrosivity and improves surface appearance by reducing the tendency of the coating to blush.

High volume solids, low VOC, coatings can be formulated using this product which can be used for a wide variety in industrial maintenance and marine applications.

For optimum overcoatability, it is recommended to use Ancamide 2652 curing agent at 70% of the theoretical stoichiometry, which equates to 90 phr with a standard Bisphenol A liquid epoxy resin.

CLEAR COAT FILM PROPERTIES

As shown in Table 1, the flexibility, direct impact resistance and dry speed of Ancamide 2652 curing agent is comparable to Ancamide 2050 and superior to Ancamide 350A. Ancamide 2652 curing agent also exhibits good reverse impact resistance compared to conventional polyamides.

TABLE 1: PERFORMANCE PROPERTIES OF CLEAR COATS

Property	Ancamide 2652	Ancamide 2050	Ancamide 350A
Direct Impact (cm.kg)	100	84	40
Reverse Impact (cm.kg)	40	20	10
BK Dry Speed Set to touch/Hard dry (H)	5/12	6/12	10/20
Pendulum Hardness (7 day)	100	100	120
Mandrel Bend	Pass	Pass	Pass

OVERCOATABILITY STUDIES

Ancamide 2652 curing agent has been evaluated in clear coats, formulation type [**A**] and mid-coats formulation type [**B**] and were found to deliver excellent long term overcoatability. The technology, after long term exposure to natural sunlight (external weathering) has demonstrated that the coating can be overcoated with the same type of epoxy formulation after 3 months exposure with no loss of adhesion. Conventional polyamides and polyamide adducts do not exhibit this property and tend to result in poor overcoatability as measured using the cross hatch adhesion method. In addition to natural sunlight, an accelerated QUV method was also developed which shows good correlation with the external test method.

CLEAR COAT FORMULATION [A]

Formulation	A-1	A-2
Liquid Epoxy resin (EEW 190)	100	100
Ancamide 2652	90	-
Conventional Polyamide	-	55
Solvent (xylene/butanol 1/1)	39	52

WHITE MID COAT FORMULATION [B]

Resin Base	B-1	B-2
Liquid Epoxy Resin	39.2	39.2
Cadura E-10	9.8	9.8
Xylene/n-butane (1:1)	10.2	10.2
Talc	36.7	36.7
TiO2	4.1	4.1
Total	**100.0**	**100.0**
Curing Agnet		
Ancamide 2652	43.0	-
Conventional Polyamide	-	26.0

OVERCOATABILITY PERFORMANCE TEST RESULTS

Coatings were applied onto sand blasted steel (SA2.5) at a wet film thickness of 200µ. After allowing each coating to achieve a tack free state (4-8hrs), panels were then placed either on an external (roof top) sun weathering panel (period 1 day to 84 days) or directly into a QUVA chamber (period 1 day to 7 days). After each panel had been exposed to the set time period, the panels were overcoated with (i) the original epoxy formulation, or (ii) a polyurethane clear coat, at a wet film thickness of 200µ. Coatings were then allowed to cure at 25°C for 7 days, followed by immersion in water at 25°C for a further 7 days. After removal from the water, panels were wiped dry with a tissue and then subjected to the cross hatch cutter test. The cross hatch was then assessed for any damage and the following ratings were applied.

Rating: 0% damage →10, 20%→8, 40%→6, 60%→4, 80%→2 , 100% (complete removal) →0

TABLE 2A: OVERCOATABILITY TEST RESULTS FOR CLEAR COATS USING NATURAL SUNLIGHT EXPOSURE (EPOXY ON EPOXY)

Formulation	A-1	A-2
Interval days		
1	10	10
7	10	6
14	10	5
28	10	4
54	10	1
86	9	1

TABLE 2B: OVERCOATABILITY TEST RESULTS FOR CLEAR COATS USING QUV EXPOSURE (EPOXY ON EPOXY)

Formulation	A-1	A-2
Interval days		
1	10	0
4	10	0
7	2	0

TABLE 2C: OVERCOATABILITY TEST RESULTS FOR WHITE MID COATS USING QUV EXPOSURE (POLYURETHANE ON EPOXY)

Formulation	B-1	B-2
Interval days		
1	10	4
4	10	3
7	6	1

The results obtained on clear coats as reported in Table 2A: show that formulation A-1, based on Ancamide 2652 curing agent delivers excellent overcoatability after 84 days natural sunlight exposure. By comparison, formulation A-2 based on a conventional polyamide adduct, has good initial overcoatability, however, after 7 days, exposure, the system shows severe signs of delamination when over coated with the same epoxy based system. Using an accelerated QUV method for measuring overcoatability, it was established that 5 days QUV exposure is approximately the equivalent to 3 months natural sunlight exposure. Clear coats subjected to QUVA as reported in Table 2B: again show that the new polyamide, Ancamide 2652 curing agent gives good overcoatability for at least 4 days, whereas under the same conditions the conventional polyamide adduct offers no degree of overcoatability. Finally, white mid coats based on Ancamide 2652 curing agent when overcoated with a standard polyurethane system, show up to 7 days overcoatability using the accelerated QUV method (corresponding to 2-3 months natural sunlight exposure), whereas the conventional polyamide adduct gives poor overcoatability after 1 day QUV exposure. The tests conducted clearly show the superior overcoatability performance properties of Ancamide 2652 vs other polyamide technology.

STARTING POINT FORMULATIONS

Appendix 1 contains a starting point formulation based on Ancamide 2652 curing agent for an anti-corrosive primer. Formulation A2652P1 is a high volume solids (70%), low VOC (270 gm/l) red iron oxide primer. The primer formulation has a low mix viscosity ~ 550 mPa.s, with a pot life of 2 hours. The coating formulation can be spray applied with conventional spray equipment or brush applied to a steel substrate without the addition of extra solvents. Set to touch is reached after 4 hours and the coating system is hard dry in less than 15 hours.

FORMULATION 2652P1 HIGH SOLIDS COATING — RED IRON OXIDE PRIMER

A-Component			Anti-Corrosive Primer
1. Liquid Epoxy Resin	DER 331	Dow Resins	217.00
2. Dispersent	Nuosperse 657		5.00
3. Thixotrope	Bentone SD-2		8.00
4. Solvent	Xylene		145.00
5. Solvent	n-Butanol		20.00
6. Pigment	Bayferrox 130M	Bayer	80.00
7. Pigment	HeucophosZCPP	Heubach	125.00
8. Filler	Blanc fix micro		180.00
9. Filler	Wollastocoat 10ES		120.00
10. Filler	Mica white 325M		100.00
			1,000.00

A-Component Manufacture Procedure:

- Charge components 1-3 and mix at low shear
- Slowly add solvent and the pigments and fillers while increasing speed to 10-20 m/s
- Grind with high speed disperser at approx. 10-20 m/s for 20min
- Complete grinding to achieve Hegman gauge 7

B-Component			
11. Curing Agent	Ancamide 2652	Evonik	205.00
Total			**1,205.00**

Mix Parts A and B and then after approximately 10-15 minutes coating mixture can be spray applied.

TECHNICAL DATA

Non Volatile (Wt)	82%	Density (g/ml) Comp A	1.74
Non Volatile (Vol)	70%	Density (g/ml) Comp B	1.07
PVC	35.8	Density (g/ml) Mix	1.57
Initial Viscosity	600 mPa.s	Mix Ratio (vol)	3:1
Pot Life	2h	VOC	268 g/l
Dry to Touch (BK, ph II, 25°C)	5h	Dry Hard (thumb)	7h
Dry to Touch (BK, ph II, 5°C)	12h		

PERFORMANCE EVALUATION

All coatings were evaluated in 5% salt spray, Prohesion and in continuous humidity at 45°C following a 10 day ambient cure. Coatings were applied to grit blasted, hot rolled steel (SA2.5) using conventional spray equipment, in double coats to give 120-150 micron DFT. In salt spray, (ASTM B-117) panels were scribed and evaluated for field blisters using the US Federal Standard Test Method # 141a, Method 6461 and the scribe creepage was rated in accordance with ASTM D-1654. Similar evaluations were made for panels placed in the prohesion cabinet (ASTM G85-94). Panels exposed to humidity were also scribed and coatings were assessed for scribe creep and filed blistering. These tests also included evaluations for changes in visual appearance.

CORROSION RESISTANCE

The anti-corrosive primer formulation was evaluated for salt spray, prohesion and constant humidity resistance for 1000h and the results obtained are presented in Table II. Following 1000 hrs salt fog and prohesion exposure, formulation 2652P1 exhibits excellent resistance with only a faint trace of damage along the scribe. In both tests there was no sign of field blistering. The coating also gave excellent humidity resistance with no scribe damage and again no signs of field blistering being observed following 1000 hrs continuous testing.

ANCAMIDE 2652 PANELS AFTER 1000H ACCELERATED WEATHERING

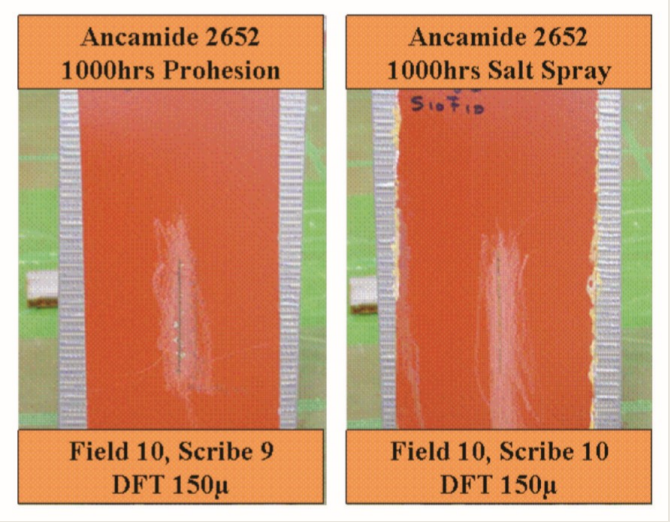
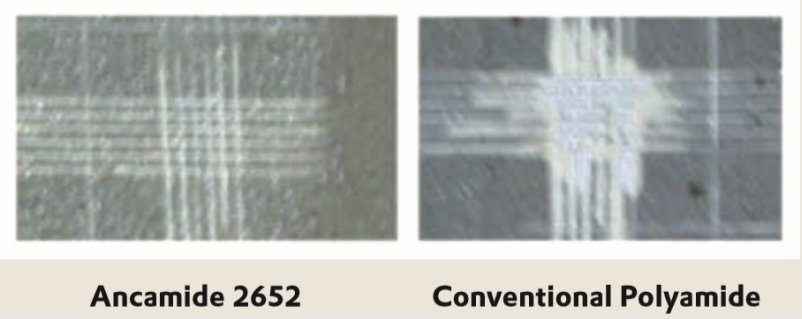


TABLE 3: ACCELERATED WEATHERING RESISTANCE — ANCAMIDE 2652P1

Test	Scribe Creep	Field Blistering	Method
Salt Spray	9	10	5% salt spray, cabinet temperature 35°C - ASTM B-117, film thickness 150µ
Prohesion	9	10	Prohesion ASTM G85-94. Dry film thickness 150µ
Cleveland Humidity	10	10	Continuous 100% humidity exposure—ASTM D-2247, cabinet temperature 45°C Rating: 10 = Best, 0 = Worst. For blister size, rating 10 = no blisters observed

POLYAMIDE SYSTEMS — CROSS HATCH ADHESION AFTER 84 DAYS NATURAL SUNLIGHT EXPOSURE



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