

Product information

ANCAMIDE[®] 221X70

Curing Agent

DESCRIPTION

Ancamide 221X70 curing agent is a member of a new series of reactive polyamides developed for use in the curing of epoxy resins in solvent-based surface coatings applications. Ancamide 221X70 is TETA free and supplied at 70% solids in xylene. Special features include good colour, colour stability, chemical resistance and excellent corrosion resistance properties. It is freely compatible with a wide range of solvents, including those generally used in epoxy resin based coatings.

TYPICAL PROPERTIES

| Property | Value | Unit | Method |
|-------------------------|--------------------|----------|---|
| Appearance | Clear Amber Liquid | | |
| Colour | 9 max | Gardner | ASTM D 1544-80 |
| Viscosity @ 25°C | 1,000-2,500 | mPa.s | Brookfield RVT D, Spindle 4 |
| Amine Value | 155±10 | mg KOH/g | Perchloric Acid Titration |
| Specific Gravity @ 21°C | 0.94 | | |
| Equivalent | 340 | Wt/{H} | |
| Recommended Use Level | 50-70 | | Theoretical value with Bisphenol A diglycidyl ether (EEW=500), calculated based on both curing agent and resin at 100% solids |
| Solids Content | 70±2 | % | |

ADVANTAGES

- Good corrosion resistance
- Rapid touch dry with solid epoxy resins
- Good colour and light stability
- Compatible with wide range of solvents

APPLICATIONS

- Solvent based marine and protective coatings
- Primers, sealers and coatings for concrete

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. Do not freeze.

STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamide 221X70 curing agent.

TYPICAL HANDLING PROPERTIES

| Property | Value | Unit | Method |
|---------------------------|-------|------|---|
| Pot Life | >7h | h | Clear coat formulation, time to double in viscosity |
| Thin Film Set Time @ 25°C | 4.5 | h | BK Drying Recorder Phase II |
| Set to touch (finger) | 1.5 | h | |
| Hard dry thumb twist | 7.5 | h | |

TYPICAL CURE SCHEDULE

(i) 2-7 Days at Room Temperature

FILM PROPERTIES AFTER 10 DAYS CURE @ 23°C

| Property | Value | Unit | Method |
|---------------------------------|-------|---------|-----------------------------|
| Perzoz Hardness | 315 | | |
| Direct impact | 175 | in.lb | |
| Reverse impact | 175 | in.lb | |
| Flexibility Cylindrical Mandrel | 3 | mm pass | Erichsen mandrel tester 266 |

SUPPLEMENTARY DATA

Ancamide 221X70 curing agent is low viscosity, solvent based polyamide, supplied at 70% solids in xylene. The product is intended for use with solvent based solid epoxy resins in the development of high performance, corrosion resistant coatings for the protection of steel and concrete. When used with type 1 solid epoxy resins (Dow DER™ 671-X75 Resin or EPON™ 1001X75 Resin), Ancamide 221X70 offers fast lacquer dry, rapid mechanical property development, good adhesion to the steel substrate and excellent long-term humidity and corrosion resistance.

Solvent based coatings can be formulated using this product which can then be used for a wide variety of industrial maintenance and marine applications.

Ancamide 221X70 has a non-critical loading and can be used at levels ranging from 40 to 100 phr with the preferred range being 50-70 phr^(a) with a solid epoxy resin EEW 500.

(a) Equates to a loading of 37.5 - 52.5 parts of Ancamide 221X70 with 100 parts DER 671-X75 as supplied.

FILM PROPERTIES

In a clear coat formulation, Ancamide 221X70 curing agent also exhibits a high degree of flexibility. As shown in Table 1, the direct impact resistance of Ancamide 221X70 is comparable to Ancamide 220X70 and superior to Ancamide 350A curing agents. Ancamide 221X70 curing agent also shows excellent reverse impact resistance (175 inch-lbs), and Ancamide 221X70 formulations can be accelerated using Ancamine® K54 (phenolic, tertiary amine accelerator). Levels can be varied to achieve the desired dry speed properties, with the preferred level in the 2.5-5.0% range based on Ancamide 221X70 curing agent use level.

TABLE 1: CLEAR COAT PERFORMANCE PROPERTIES

| Property | Ancamide 221X70 | Ancamide 220X70 | Ancamide 350A* |
|------------------------------------|-----------------|-----------------|----------------|
| Direct Impact | 175 | 175 | 35 |
| Reverse Impact | 175 | 175 | 10 |
| Dry Speed BK Phase II [h] | 4:30 | 6:00 | 10:00 |
| Dry Speed (+2.5% K54) | 2:00 | 2:30 | 5:30 |
| Specular Gloss 60# | 142 | 140 | 95 |
| Pendulum Hardness | | | |
| Day 1 | 80 | 70 | 45 |
| Day 3 | 205 | 200 | 89 |
| Day 14 | 300 | 300 | 120 |
| Conical Mandrel Bend | Pass | Pass | Pass |
| Cylindrical Mandrel Bend (mm pass) | 3 | 3 | ND |
| Cross Hatch Adhesion (dry) | Gt0 | Gt0 | Gt0 |

*Ancamide 350A tested with liquid Bis A diglycidyl ether (EEW 190); Cross hatch adhesion Gt0 = no loss of adhesion

STARTING POINT FORMULATIONS

Appendix 1 contains preliminary start point formulations based on Ancamide 221X70 curing agent for a clear coat and an anti-corrosive primer. When pigmented, these coatings exhibit a fast lacquer dry, as measured using the “finger” dry to touch method, where coatings are dry to touch in less than 2 h. Using the “Beck Koller” method, dry-hard times range from 5-9 h, depending upon the system tested, when applied and cured at 23°C. As with all solvent based coatings, dry times are influenced by solvent choice – thus dry times may vary depending upon the ratio of polar and non-polar solvents incorporated into the coating formulation. Pot lives, as measured by the time for the mix to double in viscosity, are in the 6-8 hours range — typical for such solvent based polyamide systems.

Formulation A221X70P1 (Table 4) is a low volume solids (43%), medium PVC (34%) primer, with a 3:1 mix ratio by volume, based on epoxy resin to amine hardener. The initial viscosity of the formulated resin base is 2,300 mPa.s and the mix viscosity of the system is 500 mPa.s with a total VOC of 485 g/l. The primer formulation is compatible with a variety of different let down solvents (including xylene, n-butanol, MIBK, methoxy-propanol, etc) and can be further let down if required for additional spray applications. The coating formulation can be applied with conventional spray equipment or brush applied to the steel substrate. After application the primer is dry to handle after 5 h.

Formulation A221X70P1 has been evaluated for corrosion resistance properties using salt spray, humidity and prohesion resistance accelerated weather tests. After 1000 h exposure, coatings exhibit excellent corrosion resistance. No signs of field blisters have been detected using the above weather tests, with panels exhibiting no scribe creep in the salt spray test and some minor damage around the scribe when subjected to the prohesion test study. For comparative purposes, Ancamide 220X70 curative was also included in the test study as the “industry” standard reference. In all the corrosion resistance tests carried out, both Ancamide 221X70 and Ancamide 220X70 curing agents demonstrated comparable performance.

PERFORMANCE EVALUATION

All coatings were evaluated in 5% salt spray, and in continuous humidity at 35°C. They were also evaluated using a prohesion - cyclic weathering tester, and Cleveland - constant humidity exposure, following a 10 day ambient cure of applied coatings. Coatings were applied to grit blasted, hot rolled steel (SA2.5), using conventional spray equipment, in double coats to give coatings with a 75-100µ dry film thickness (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 creep 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 not scribed and coatings were assessed for blistering only. These tests also included evaluations for changes in visual appearance.

CORROSION RESISTANCE

Anti-corrosion resistant primers based on Ancamide 221X70 and Ancamide 220X70 curatives, were evaluated for salt spray and constant humidity resistance. The results obtained are presented in Tables 6-8. Following 1000 h salt fog exposure, formulations A221X70P1 and A220X70P1 both exhibit excellent resistance. Both formulations also demonstrated excellent humidity resistance with no signs of field blistering being observed following 2000 h continuous testing.

TABLE 2: SALT SPRAY RESISTANCE - ANCAMIDE 221X70 AND ANCAMIDE 220X70 [1000H]

| Formulation | Scribe Creep | Field Blistering | Blister Size |
|--|--------------|------------------|--------------|
| A221X70P1 | 10 | 10 | 10 |
| A220X70P1 | 9 | 10 | 10 |
| 5% salt spray, cabinet temperature 35oC — ASTM B-117, film thickness 75-100μ | | | |
| Rating: 10 = Best (no blisters), 0 = Worst | | | |

TABLE 3: PROHESION EXPOSURE - ANCAMIDE 221X70 AND ANCAMIDE 220X70 [1000H]

| Formulation | Scribe Creep | Field Blistering | Blister Size |
|--|--------------|------------------|--------------|
| A221X70P1 | 7 | 10 | 10 |
| A220X70P1 | 6 | 10 | 10 |
| Prohesion ASTM G85-94 | | | |
| Film thickness 75-100μ. Rating: 10 = Best, 0 = Worst | | | |
| For blister size, rating 10 = no blisters observed | | | |

TABLE 4: CLEVELAND HUMIDITY EXPOSURE - ANCAMIDE 221X70 AND ANCAMIDE 220X70 [2000H]

| Formulation | Field Blistering | Blister Size |
|---|------------------|--------------|
| A221X70P1 | 10 | 10 |
| A220X70P1 | 10 | 10 |
| Continuous 100% humidity exposure — ASTM D-2247, cabinet temperature 50°C | | |
| Film thickness 75-100μ. Rating: 10 = Best, 0 = Worst | | |
| For blister size, rating 10 = no blisters observed | | |



PROHESION PANELS 1000H EXPOSURE

Ancamide 221X70



Field 10
Scribe 7

Ancamide 220X70



Field 10
Scribe 6

APPENDIX I

TABLE 5: ANCAMIDE 221X70 CURATIVE CLEAR COAT FORMULATION

| A-Component (g) | | | Clear Coat |
|--|-----------------|--------|---------------|
| 1. Epoxy Resin | DER 671X75 | Dow | 410.00 |
| 2. Solvent | MIBK | | 80.00 |
| 3. Solvent | Dowanol PM | | 10.00 |
| | | | 500.00 |
| A-Component Manufacture Procedure: | | | |
| Charge components 1-3 and stir homogeneous at low shear | | | |
| B-Component (g) | | | |
| 1. Curing Agent | Ancamide 221X70 | Evonik | 155.00 |
| 2. Solvent | Xylene | | 140.00 |
| 3. Solvent | Dowanol PM | | 140.00 |
| | | | 435.00 |
| Total | | | 935.00 |
| After mixing Part A and B, apply a 15-30 minute induction time prior to application. | | | |

TABLE 6: TECHNICAL DATA

| | | |
|--------------------------|----------|---------|
| Mixing Ratio | Weight | 1.1 : 1 |
| | Volume | 1.0 : 1 |
| Density (g/ml) | - Part A | 1.02 |
| | - Part B | 0.93 |
| | - Mix | 0.98 |
| Solid Content (weight %) | - Part A | 61.5 |
| | - Part B | 25.0 |
| | - Mix | 44.5 |
| VOC | g/l | 540 |
| Mix Viscosity @ 25°C | mPa.s | 300 |
| Pot-life | h | 7 |
| Gloss (60°) | | 142 |
| BK Dry time 23°C | | |
| Phase I | h | 1.30 |
| Phase II | h | 4.30 |
| Phase III | h | 9.30 |
| Hard Dry Thumb Twist | h | 7:30 |
| Persoz Hardness | 14 days | 300 |
| MEK Double Rubs | | >200 |

TABLE 7: ANCAMIDE 221X70P1 ANTI-CORROSIVE PRIMER FORMULATION

| | | | Anti-Corrosive Primer |
|--|-----------------|---------|-----------------------|
| A-Component (g) | | | |
| 1. Epoxy Resin | DER 671X75 | Dow | 280.00 |
| 2. Solvent | MIBK | | 80.00 |
| 3. Solvent | Xylene | | 110.00 |
| 4. Solvent | n butanol | | 30.00 |
| 5. Filler | Blanc fix micro | | 100.00 |
| 6. Filler | Talc 10MO | | 100.00 |
| 7. Filler | Heucophos ZPO | Heubach | 140.00 |
| 8. Filler | Bayferrox 130M | Bayer | 150.00 |
| | | | 1,000.00 |
| A-Component Manufacture Procedure: | | | |
| <ul style="list-style-type: none"> • Charge components 1-3 and stir homogeneous at low shear • Slowly add components 5-8 and then mix under high shear for 15-30 mins until Hegman gauge 7 is achieved | | | |
| B-Component (g) | | | |
| 1. Curing Agent | Ancamide 221X70 | Evonik | 106.00 |
| 2. Solvent | Xylene | | 59.00 |
| 3. Solvent | Dowanol PM | | 35.00 |
| | | | 200.00 |
| Total | | | 1,200.00 |
| After mixing Part A and B, apply a 15-30 minute induction time prior to application. | | | |

TECHNICAL DATA

| | | |
|--------------------------|----------|---------|
| Mixing Ratio | Weight | 5.0 : 1 |
| | Volume | 3.0 : 1 |
| Density (g/ml) | - Part A | 1.51 |
| | - Part B | 0.92 |
| | - Mix | 1.37 |
| Solid Content (weight %) | - Part A | 70.0 |
| | - Part B | 37.1 |
| | - Mix | 64.5 |
| Solid Content (Volume %) | - Part A | 46.0 |
| | - Part B | 31.5 |
| | - Mix | 42.5 |
| Mix Viscosity @ 25°C | mPa.s | 300 |
| VOC | g/l | 484 |
| PVC | % | 33.8 |
| Pot-life | h | 7 |
| Gloss (60°) | | 25 |
| BK Dry time 23°C | | |
| Phase I | h | 1.30 |
| Phase II | h | 4.00 |
| Hard Dry Thumb Twist | h | 3.00 |
| Persoz Hardness | 7 days | 185 |
| Direct impact | in.lb | 170 |
| Reverse impact | in.lb | 153 |

1. An additional 20g of xylene/n-butanol (1:1) solvent added to achieve desired spray viscosity

* Reference formulation A220X70P1 is as above but substituting the Ancamide 221X70 curing agent with Ancamide 220X70

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