Product information

ANCAMINE® 2049

Curing Agent

DESCRIPTION

Ancamine 2049 curing agent is an unmodified cycloaliphatic amine used to cure epoxy resins at elevated temperatures. It has been designed for use for large composite structural parts where longer pot life is required.

TYPICAL PROPERTIES

Property	Value	Unit
Appearance	Clear Liquid	
Colour	1	Gardner
Viscosity @ 77°F (25°C)	120	cP
Specific Gravity @ 77°F (25°C)	0.947	
Amine Value	484	
Flash Point (closed cup)	285 /545	°C/°F
Equivalent	60	Wt/{H}
Use Level (1)	32.0	PHR

ADVANTAGES

- Low viscosity
- Long pot life at moderate temperatures
- Excellent mechanical properties following elevated temperature cure
- Good resistance against acids, alkalies, water, and hydrocarbon solvents when heat cured

APPLICATIONS

- Structural Composites
  - – Larger Pipes & Composite Fittings
  - – Wind Blades
  - – Tanks
- Casting and Tooling

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RECOMMENDED PROCESSING

- Resin Infusion
- Filament Winding
- Wet lay-up Laminates
- Resin Transfer Molding
- Prepreg

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 Ancamine 2049 curing agent.

TYPICAL CURE SCHEDULE

1 hour at 80°C (176°F), then 2 hours at 150°C (302°F)
2 hours at 80°C (176°F), then 3 hours at 150°C (302°F)

TYPICAL HANDLING PROPERTIES*

Property	Value	Unit
Mixed Viscosity @ 77°F /25°C	1,900	cP
Gel Time (150g mix @ 77°F /25°C)	421	Min
Time to 10,000cPS @ 104°F / 40°C	174	Min

THERMAL PERFORMANCE*

Property	Value	Unit
Glass Transition Temperature (DSC second scan)	155 - 170 / 311 -338	°C / °F

* Ancamine 2049 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=180) epoxy resin

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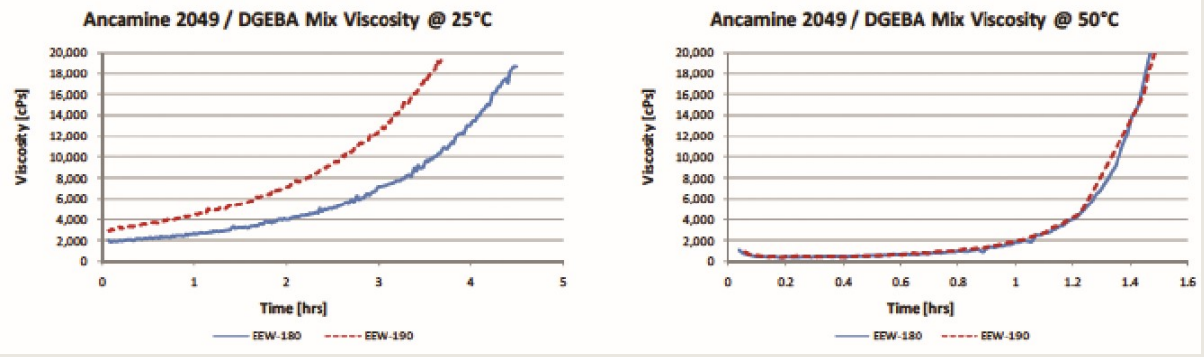
VISCOSITY PROFILE

Ancamine 2049 curatives provide the longest pot life of any commercial cycloaliphatic amine. This inherent feature is due to the methyl group sterically hindering the reaction between the epoxy and amine, which makes it suitable for the fabrication of very larger composite structural parts. Figure 1 shows the viscosity build of the Ancamine 2049 curative with both EEW=180 and EEW=190 DGEBA resin at two different processing temperatures (25°C and 50°C).

FIGURE 1: ANCAMINE 2049 / DGEBA MIX VISCOSITY @ 77°F (25°C) AND 122°F (50°C)



MECHANICAL PROPERTIES

In addition to the cure cycle and processing conditions used, the selection of an epoxy curing agent is a critical factor in determining the structural integrity of a composite part. Evonik offers a wide selection of amine based curing agents which can be used to maximize load-bearing capabilities, fatigue resistance, and fracture toughness in a fully formulated system. Mechanical properties of epoxy cured with Ancamine 2049 curative in the presence of E-glass fiber are shown in the following table.

Composite Panel Fabrication
Method: Vacuum Assisted Resin Transfer Molding (VARTM)
Fiber Type: E-glass (275g/m2) unidirectional
Fiber Volume: 60 ± 3%
Cure Schedule: 1 hr @ 80°C, then 3 hrs @ 150°C

Mechanical Performance - Composite Panel	SI	English
Flexural Strength 0° Longitude (ASTM D790)	1043 MPa	151.3 ksi
Flexural Modulus 0° Longitude (ASTM D790)	39.0 GPa	5.7 Msi
Flexural Ultimate Strain %(ASTM D790)	2.6%	
ILSS 0° Longitude (ASTM D2344)	73.00 MPa	10.6 ksi
ILSS 90° Transverse (ASTM D2344)	23.00 MPa	3.34 ksi

MECHANICAL PERFORMANCE - CAST PANEL*

Flexural Strength (psi)	127 MPa	1.85 ksi
Flexural Modulus (thousand psi)	2.7 GPa	0.4 Msi
Tensile Strength (psi)	77 MPa,	11.2 ksi
Tensile Modulus (thousand psi)	2.6 GPa	0.37 Msi
Tensile Elongation @ Break	3.8%	
Compressive Strength	216 MPa	31 ksi
Compressive Modulus	2.1 GPa	0.3 Msi
Fracture Toughness K_{1C}	0.62 MPa*$m^{1/2}$	564 psi*$in^{1/2}$
Fracture Toughness G_{1C}	121 J/m^2	0.68 in-lb/in^2
Izod Impact Strength	43.0 J/m	0.8 ft-lb/in

MECHANICAL PERFORMANCE - COMPOSITE PANEL*

ILSS 0° Longitude	73.00 MPa	10.6 ksi
ILSS 90° Transverse	23.00 MPa	3.3 ksi
Flexural Strength - Composite 0° Longitude	1043 MPa	151 ksi
Flexural Modulus -Composite 0° Longitude	39.0 GPa	5.7 Msi

CHEMICAL RESISTANCE

DGEBA epoxy resin cured with Ancamine 2049 curative exhibits excellent chemical resistance in various reagents when cured at higher temperatures. Chemical resistance can be further improved by using a blend of Bis-F or multifunctional resin with DGEBA resin.

* Ancamine 2049 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=180) epoxy resin

Chemical Resistance Test
Formulation: DGEBA Epoxy Resin Mix (EEW-180)
Cure Schedule: 2 hrs @ 80°C, then 3 hrs @ 150°C
Specimen: 1" X 3" X 1/8" bar
Test: % Weight gain after 120 days immersion @73°F / 24°C

Reagent	% Weight Gain
Water (Distilled)	1.65%
Toluene	0.33%
Acetone	16.51%
Ethanol	1.47%
Methanol	9.86%
HNO3 (10%)	5.72%
Acetic Acid (25%)	12.95%
NH4OH (10%)	1.59%

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