

# ANCAMINE® DL50 Curing Agent

## DESCRIPTION

Ancamine DL50 curing agent is a liquid mixture of aromatic amines based on methylenedianiline (MDA). In addition to MDA, Ancamine DL50 curative contains polymethylene polyanilines and aromatic amines with functionality greater than 4. The multi-functional nature of polymethylene polyanilines can increase the crosslink density of a completely cured epoxy compared with methylenedianiline. Ancamine DL50 curative is best suited for use as an epoxy curative in forced cure applications. This aromatic, multifunctional curative can be used to produce high-strength, chemically-resistant, elevated temperature tolerant epoxy parts. Epoxy systems cured with Ancamine DL50 curative offer excellent resistance to water, acid, alkali and hydrocarbon solvents.

## ADVANTAGES

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

## APPLICATIONS

- Laminating
- Filament Wound Pipe / Liners / Fittings
- Pre-preg Fabrication
- Casting and Tooling

## RECOMMENDED PROCESSING

- Filament Winding
- Resin Transfer Molding
- Wet Lay-Up Laminates

## 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 DL50 curing agent.

## TYPICAL CURE SCHEDULE (will vary with application)

- 2 hours at 176°F, then 3 hours at 302°F
- 2 hours at 80°C, then 3 hours at 150°C

## TYPICAL PROPERTIES

Appearance	Yellow to Light Brown
Color (Gardner)	9
Viscosity @ 77°F / 25°C	55,000 @ 30°C
Specific Gravity @ 77°F / 25°C	1.1
Equivalent Wt/{H}	51
Use Level (PHR)	28.0

## TYPICAL HANDLING PROPERTIES\*

Mixed Viscosity @ 140°F / 60°C	335 cPs
Gel Time (150g mix @ 77°F / 25°C)	480 min
Time to 10,000 cPs @ 140°F / 60°C	189 min

## THERMAL PERFORMANCE\*

Glass Transition Temp (DSC second scan)	161°C / 322°F
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## MECHANICAL PERFORMANCE - CAST PANEL\*

Flexural Strength	175 MPa / 25.4 ksi
Flexural Modulus	3.4 GPa / 0.49 Msi
Tensile Strength	73 MPa / 10.6 ksi
Tensile Modulus	3.2 GPa / 0.46 Msi
Tensile Elongation @ Break	4.4%
Compressive Strength	121 MPa / 17.5 ksi
Compressive Modulus	2.0 GPa / 0.29 Msi

## MECHANICAL PERFORMANCE - COMPOSITE PANEL\*

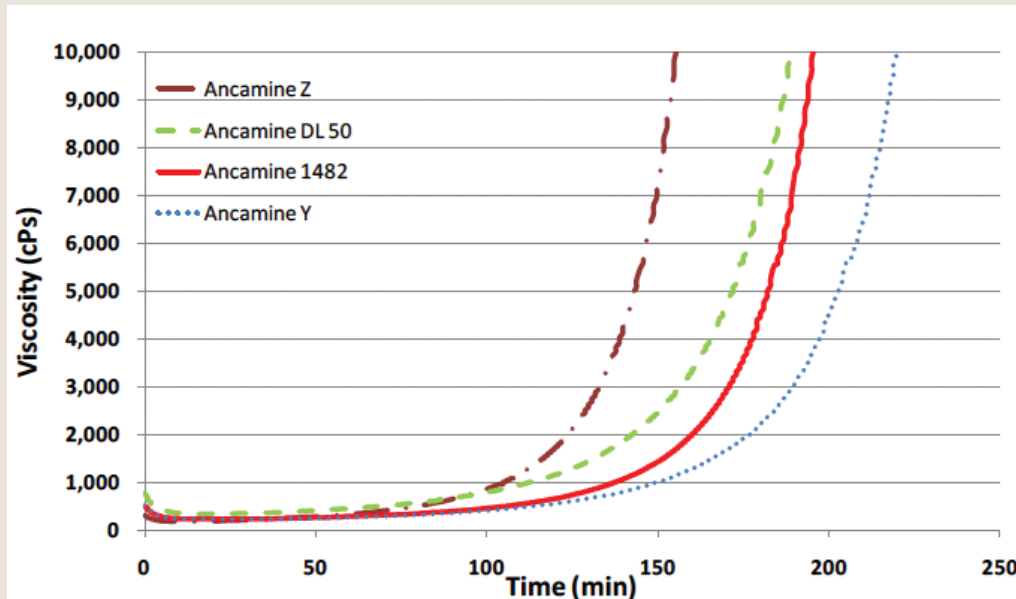
ILSS 0° Longitude	74 MPa / 10.7 ksi
Flexural Strength - Composite 0° Longitude	1172 MPa / 170.0 ksi
Flexural Modulus - Composite 0° Longitude	52.8 GPa / 7.66 Msi

\* Ancamine DL 50 curing agent formulated with standard Bisphenol-A based (DGEBA, EEW=180) epoxy resin

## SUPPLEMENTARY DATA

**Reactivity and Development of Cure:** Ancamine® DL50, Ancamine 1482, Ancamine Y, and Ancamine Z curing agents offer a range of reactivity with epoxy resin while maintaining the high mechanical properties and chemical resistance typical of aromatic amines. Blended with standard diglycidyl ether of bisphenol-A (DGEBA) epoxy resin, systems can provide a 2 to 3.5 hour pot life even at 60°C. Figure 1 shows the viscosity build of aromatic amines with EEW=180 DGEBA Ancamine resin at 60°C.

**FIGURE 1: AROMATIC AMINE DGEBA (EEW-180) MIX VISCOSITY BUILD AT 60°C**



**Chemical Resistance:** DGEBA epoxy resin cured with Ancamine DL-50, Ancamine 1482, Ancamine Y, and Ancamine Z curatives exhibits excellent chemical resistance. with DGEBA resin. Chemical resistance can be further enhanced using novalac epoxy resins.

### 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" Disc

Test: % Weight gain after 120 days immersion @73 °F / 24°C

Reagent	Ancamine DL50	Ancamine 1482	Ancamine Y	Ancamine Z
Water (Distilled)	0.6%	0.9%		
Jet Fuel C	0.1%		0.6%	0.3%
Toluene	0.2%	0.4%	0.2%	0.1%
Acetone	10.7%		15.9%	20.1%
Ethanol	0.8%	0.5%	0.6%	0.7%
Methanol	5.0%	1.4%		
HNO <sub>3</sub> (20%)	0.9%	1.0%	0.3%	0.3%
Acetic Acid (25%)	1.4%	0.7%	1.1%	1.1%

**ANCAMINE® DL50** Curing Agent**SUPPLEMENTARY DATA**

**Performance Properties:** Ancamine® DL50, Ancamine 1482, Ancamine Y, and Ancamine Z curing agents are mixtures of aromatic amines designed for the curing of liquid epoxy resins at elevated temperatures. See below table for a comparison of typical properties.

Typical Properties	Ancamine DL50	Ancamine 1482	Ancamine Y	Ancamine Z
Appearance	Yellow to Light Brown	Dark Brown Liquid	Yellow to Light Brown	Dark Liquid
Color (Gardner)	9	18	6	No data
Viscosity @ 77°F / 25°C	55,000 @ 30°C	1,900 cP	1,200 cP	2,200 cP
Specific Gravity @ 77°F / 25°C	1.10	1.15	1.14	1.14
Equivalent Wt/{H}	51	42	48.5	38
Use Level (PHR)	28.0	23.0	27.0	21.0
Typical Handling Properties (1)				
Mixed Viscosity @ 140°F / 60°C	335 cP	235 cPs	235 cPs	185 cPs
Gel Time (150g mix @ 77°F / 25°C)	480 min	960 min	480 min	480 min
Time to 10,000 cPs @ 140°F / 60°C	189 min	195 min	220 min	155 min
Thermal Performance (1)				
Glass Transition Temperature (DSC second scan)	161°C / 322°F	160°C / 320°F	167°C / 333°F	155°C / 311°F
Mechanical Performance - Cast Panel (1)				
Flexural Strength	175 MPa / 25.4 ksi	123 MPa / 17.8 ksi	177 MPa / 25.7 ksi	164 MPa / 23.8 ksi
Flexural Modulus	3.4 GPa / 0.49 Msi	2.5 GPa / 0.36 Msi	3.7 GPa / 0.54 Msi	3.7 GPa / 0.54 Msi
Tensile Strength	73 MPa / 10.6 ksi	81 MPa / 11.7 ksi	60 MPa / 8.7 ksi	74 MPa / 10.7 ksi
Tensile Modulus	3.2 GPa / 0.46 Msi	2.8 GPa / 0.41 Msi	3.3 GPa / 0.48 Msi	3.7 GPa / 0.54 Msi
Tensile Elongation @ Break	4.4%	5.3%	4.2%	4.4%
Compressive Strength	121 MPa / 17.5 ksi	122 MPa / 17.7 ksi	120 MPa / 17.4 ksi	129 MPa / 18.7 ksi
Compressive Modulus	2.0 GPa / 0.29 Msi	2.2 GPa / 0.32 Msi	2.1 GPa / 0.30 Msi	3.1 GPa / 0.45 Msi
Izod Impact Strength		45.6 J/m / 0.3 ft-lb/in	33.6 J/m / 0.2 ft-lb/in	
Mechanical Performance - Composite Panel (2)				
ILSS 0° Longitude	74 MPa / 10.7 ksi	71 MPa / 10.4 ksi	70 MPa / 10.1 ksi	72 MPa / 10.5 ksi
Flexural Strength - Composite 0° Longitude	1172 MPa / 170.0 ksi	1310 MPa / 190.0 ksi	1269 MPa / 184.0 ksi	1282 MPa / 186.0 ksi
Flexural Modulus - Composite 0° Longitude	52.8 GPa / 7.66 Msi	54.1 GPa / 7.85 Msi	55.2 GPa / 8.0 Msi	49.0 GPa / 7.81 Msi

(1) Curing agents formulated with standard Bisphenol-A based (DGEBA, EEW=180) epoxy resin

(2) VARTM Process using E-glass (275g/m<sup>2</sup>) unidirectional fiber; 60% Volume ±3%; Cured for 2 hours at 80°C ad 3 hours at 150°C

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