

Cardolite[®] FormuLITE[™] 2501A + 2405B

Liquid Epoxy System

Technical Datasheet

DESCRIPTION

Cardolite FormuLITE 2501A and FormuLITE 2405B are a two-component epoxy system recommended for the manufacturing of reinforced composites by wet lay-up, lamination and resin transfer molding (RTM). Both the epoxy resin and the amine hardener are based on components from renewable sources. The calculated bio-based content of the system is 36.9%.

PROPERTIES

PROPERTY	TYPICAL VALUES ¹	TEST METHOD
RESIN FormuLITE 2501A		
Appearance	Clear liquid	Visual
Color (Gardner)	≤ 1	ASTM D1544
Viscosity @ 25°C (cPs)	2,200	ASTM D2196
Density @ 25°C (kg/L) (lbs/gal)	1.14 9.52	ASTM D1475
Flash point	> 150°C / 302°F	ASTM D93
Shelf Life (Months)	12	-
HARDENER FormuLITE 2405B		
Appearance	Light Orange Liquid	Visual
Color (Gardner)	≤ 12	ASTM D1544
Viscosity @ 25°C (cPs)	950	ASTM D2196
Density @ 25°C (kg/L) (lbs/gal)	1.01 8.45	ASTM D1475
Shelf Life (Months)	12	-

¹Typical properties are not to be construed as specifications

RECOMMENDED PROCESSES

Epoxy-based composites:

- Wet lay-up
- Resin transfer molding (RTM)
- Laminates

ADVANTAGES

- Room temperature cure and mould release
- Good processability
- Good wetting of carbon, glass and natural fibers
- Good mechanical and thermal properties
- Excellent water, acid and alkali resistance
- Based on renewable raw material feedstock

TYPICAL PROCESSING DATA

PROPERTIES	TYPICAL VALUES	TEST METHOD
Mixing ratio by weight	100:41	-
Mixing ratio by volume	100:45	-
Initial mix viscosity @ 25°C (cPs)	1,635	ASTM D2196
Initial mix viscosity @ 40°C (cPs)	650	ASTM D2196
Pot life, 100 g mix @ 25°C (min)	28	Internal Method ²
Pot life, 100 g mix @ 40°C (min)	11	Internal Method ²
Peak exotherm, 100 g mix @ 25°C (°C)	138	ASTM 2471-99
Peak exotherm, 100 g mix @ 40°C (°C)	157	ASTM 2471-99

²Pot life is measured when the formulation reaches a limit viscosity of 10,000 cPs starting from the reference temperature.

TYPICAL CURED SYSTEM PROPERTIES

PROPERTIES	TYPICAL VALUES ³	TEST METHOD
Ultimate glass transition temperature ⁴ (°C)	79	ASTM 3418-99
Glass transition temperature (°C) after RT curing (100g, 3 cm thick)	78	ASTM 3418-99
Tensile strength (MPa)	67	ASTM D638-10
Tensile modulus (MPa)	2,608	ASTM D638-10
Tensile elongation at Fmax (%)	5.08	ASTM D638-10
Tensile elongation at break (%)	6.75	ASTM D638-10
Flexural strength (MPa)	106	ISO 178
Flexural modulus (MPa)	2,942	ISO 178
Bio-based content (% wt.)	36.9%	Calculated

³Curing schedule: 4h@RT + 2h@80°C

⁴DSC scan from 0 to 200°C at 20°C/min, 2nd run

CURING AND POST CURING

Post-curing is advisable for ambient cured systems to reach their best mechanical and thermal properties. It is recommended that cure and post-cure conditions be evaluated based on the size and shape of the composite part.

Flexural properties and glass transition temperature after different curing cycles are shown below.

CURING SCHEDULE	FLEXURAL STRENGTH (MPa)	FLEXURAL MODULUS (MPa)	FLEXURAL ELONGATION AT BREAK (%)	GLASS TRANSITION TEMPERATURE (°C)
7 days at 23°C	82	2,789	3.3	59
24 hrs at 23°C + 4 hrs at 60°C	106	2,942	15.3	79

MIXING INSTRUCTIONS

It is recommended that components be weighed carefully to prevent mixing inaccuracies, which can adversely affect the properties of the final product. Both components should be mixed thoroughly to ensure homogeneity. In case of air entrapment, appropriate quantities of air release additives can be used. Pot life decreases when large amounts of mixture are prepared due to the exothermic reaction. It is recommended to split large amounts of mixture into smaller containers.

REGULATORY STATUS

Please refer to the material safety data sheet (MSDS). Specific information regarding chemical inventory listing can be obtained from your local sales representative.

SAFETY PRECAUTIONS

Please refer to the material safety data sheet (MSDS). Copies of the MSDS can be requested on the Cardolite website or via your local sales representative.

STABILITY AND STORAGE

Cardolite epoxy resins and hardeners may absorb moisture and carbon dioxide when left in open containers, which could result in increased viscosity, discoloration, reduction of reactivity, and/or crystallization of the products. These products should be kept tightly sealed in their original containers when not in use, and stored in a cool, dry place. Some Cardolite epoxy resins might crystallize. This reversible, physical phenomena can be greatly avoided by storing the resin at temperatures not below 25°C.

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