

# Cardolite® FormuLITE™ 2501A + 2401B

## Liquid Epoxy System

## Technical Datasheet

### DESCRIPTION

Cardolite FormuLITE 2501A and FormuLITE 2401B are a two-component epoxy system recommended for the manufacturing of reinforced composites by wet lay-up, resin transfer molding (RTM), lamination and vacuum infusion. Both the epoxy resin and the amine hardener are based on components from renewable sources. The calculated bio-based content of the system is 34%.

### PROPERTIES

PROPERTY	TYPICAL VALUES <sup>1</sup>	TEST METHOD
<b>RESIN FormuLITE 2501A</b>		
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	-
<b>HARDENER FormuLITE 2401B</b>		
Appearance	Light Yellow Liquid	Visual
Color (Gardner)	≤ 8	ASTM D1544
Viscosity @ 25°C (cPs)	90	ASTM D2196
Density @ 25°C (kg/L) (lbs/gal)	0.95 7.93	ASTM D1475
Flash point	> 110°C / 230°F	ASTM D93
Shelf Life (Months)	12	-

<sup>1</sup>Typical properties are not to be construed as specifications

### RECOMMENDED PROCESSES

Epoxy-based composites:

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

### ADVANTAGES

- Good processability
- Good wetting of carbon, glass and natural fibers
- Good mechanical and thermal properties
- Improved water, acid and alkali resistance
- Based on renewable raw material feedstock

## TYPICAL PROCESSING DATA

PROPERTIES	TYPICAL VALUES	TEST METHOD
Mixing ratio by weight	100:31	-
Mixing ratio by volume	100:37	-
Mix viscosity @ 25°C (cPs)	905	ASTM D2196
Mix viscosity @ 40°C (cPs)	302	ASTM D2196
Pot life, 100 g mix @ 23°C (min)	95	Internal Method <sup>2</sup>
Pot life, 100 g mix @ 40°C (min)	50	Internal Method <sup>2</sup>
Peak exotherm, 100 g mix @ 23°C (°C)	30	ASTM 2471-99
Peak exotherm, 100 g mix @ 23°C (°C)	80	ASTM 2471-99

<sup>2</sup>Pot 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 <sup>3</sup>	TEST METHOD
Ultimate glass transition temperature <sup>4</sup> (°C)	100	ASTM 3418-99
Water absorption at 25°C (7/14 days)	0.41/0.60	ASTM D543
Alkali resistance - 10% sodium hydroxide at 25°C (7/14 days)	0.37/0.49	ASTM D543
Acid resistance - 3% sulfuric acid at 25°C (7/14 days)	0.70/0.95	ASTM D543
Tensile strength (MPa)	69	ASTM D638-10
Tensile modulus (MPa)	3,134	ASTM D638-10
Tensile elongation at Fmax (%)	5.2	ASTM D638-10
Tensile elongation at break (%)	6.6	ASTM D638-10
Flexural strength (MPa)	113	ISO 178
Flexural modulus (MPa)	2,788	ISO 178
Bio-based content (% wt.)	34.0%	Calculated

<sup>3</sup>Curing schedule: 4h@RT + 2h@100°C

<sup>4</sup>DSC scan from 0 to 200°C at 20°C/min, 2<sup>nd</sup> 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. In the case of room temperature curing, some heat treatment at a minimum of 50°C (122°F) should be done before demolding.

## 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

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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

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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

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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.

## CONTACT INFORMATION

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