

GRAPHISTRENGTH[®] C S-450

CARBON NANOTUBE STRENGTHENED LIQUID EPOXY RESIN

TECHNICAL DATA SHEET

Description:

Graphistrength[®] C S-450 is a bisphenol-A multi-wall carbon nanotube strengthened liquid epoxy resin suitable for numerous composites and adhesives applications.

Key features:

Graphistrength[®] C S-450 has the following key characteristics:

| Property | Method | Unit | Typical value ⁽¹⁾ |
|---|-----------|-------------------|------------------------------|
| Aspect | Visual | | Black |
| EEW | ISO 3000 | g/eq | 184-193 |
| Viscosity at 25°C (3.4s ⁻¹) | Rheometer | mPa.s | 22,000-24,000 |
| Viscosity at 50°C (4.1s ⁻¹) | Rheometer | mPa.s | 2,100-2,350 |
| Density at 25°C | ISO 1675 | g/cm ³ | 1.17 |

⁽¹⁾ Data not intended for specification purposes

Applications and benefits:

Graphistrength[®] C S-450 is recommended for use in composite manufacturing processes such as filament winding, pultrusion, and wet lay-up. Graphistrength[®] C S-450 can be used with most reinforcing fibers and fabrics, such as carbon, glass, and aramid. It can also be used in adhesives and coatings applications.

The carbon nanotube enhancement makes Graphistrength[®] C S-450 a high strength epoxy resin. It also processes as easily as unfilled epoxy resin and can be cured with a wide range of curing agents.

The use of Graphistrength[®] C S-450 allows a considerable increase in flexural and compression properties of composites.

Graphistrength[®] C S-450 has an intermediate viscosity in the bisphenol-A based Graphistrength[®] line

Dilution and processing:

Strengthened with an optimum level of carbon nanotubes, Graphistrength[®] C S-450 can be used in the same conditions as for classical epoxy liquid resins.

Graphistrength[®] C S-450 can be used with different kinds of hardeners depending on the desired mechanical properties. As for classical bisphenol-A resins, mixing the resin with the hardener can be easier with preliminary heating of Graphistrength[®] C S-450 at 70 °C or more.

Typical properties:

Mechanical properties of the cured Graphistrength[®] CS-450 resin

| System | |
|---|-------------------------------------|
| Curing agent (aromatic amine) | Epikure W |
| Resin | Graphistrength [®] C S-450 |
| Resin/Curing (phr) | 100/24 |
| Mix viscosity at 25°C (mPa.s) (3.4s ⁻¹) | 5,000-5,350 |
| Pot life, 2x Initial viscosity (h) | 8 |
| Gel time at 177°C (min) | 14 |
| Cure Cycle | 1h at 150°C and 2h at 177°C |
| Properties⁽²⁾ | |
| Flexural Strength (MPa) | 173 |
| Flexural Modulus (MPa) | 3,290 |
| Compression Strength (MPa) | 172 |
| Compression Modulus (MPa) | 3,172 |
| Tg (°C) | 155 |

⁽²⁾ Data are intended solely for indicating potential performance that can be achieved. They don't replace the reader's own evaluations and experimentation

Mechanical properties of a composite powered by Graphistrength[®] C S-450 resin

Wet lay-up/autoclave (0,5MPa)

| Composite | |
|---------------------------------|-----------------------------|
| Curing agent (aromatic amine) | Epikure W |
| Carbon fabric ratio | 60%vol |
| Carbon Fabric type | Plain weave |
| Number of fabric plies | 8 |
| Cure cycle | 1h at 150°C and 2h at 177°C |
| Properties⁽³⁾ | |
| Flexural Strength (MPa) | 940 (+47%) |
| Flexural Modulus (MPa) | 60,200 (+24%) |

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Packaging and Storage:

Graphistrength[®] C S-450 is provided in drums of 20kg or 220kg net.
Graphistrength[®] C S-450 should be stored in dry place, preferably in its sealed original container, at temperatures between 2 and 40°C. In these storage conditions, the shelf life is around 9 months.
The product should not be stored exposed to direct sunlight. A potential crystallization of the product could occur. It can be restored to its original state by stirring at 70 °C.

Safety and Handling:

Graphistrength[®] C S-450 doesn't present any specific health risk when using in thermoset processing. Mandatory and recommended industrial hygiene procedures should be followed whenever the product is being handled and processed.
Consult the product MSDS for additional information on properties, hazards and handling.

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Graphistrength[®] C S-450 is developed in collaboration with Zyvex Performance Materials

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