



## Epsilon 99100

### Resin Transfer Molding Resin and Binder

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#### **Description**

Epsilon 99100 is a one component, Benzoxazine resin system which can be stored for up to 12-months at room temperature. Epsilon 99100 has high temperature performance and low flammability properties. Epsilon 99100 is intended for use in Resin Transfer Molding (RTM) and Vacuum Assist Resin Transfer Molding (VARTM) applications. It is particularly suitable for the manufacture of large parts due to the broad process window, low exotherm, and low resin shrinkage on cure. The resin is intended for use with the tailored binder Epsilon 99900. This is a powder binder which should be applied to each ply for maximum effect. The level of binder used will depend on the preform and composite mechanical performance requirements.

#### **Features and Benefits**

- Room temperature stability- no refrigerated storage or shipping is required.
- One-part system- no mixing is required
- Broad processing window- suitable for large parts and intricate shapes
- Viscosity stability- long injection window for large parts
- Low heat release during cure- allows manufacture of large parts, lowers residual stresses
- Low cure shrinkage- improved translation of strength in final part
- Fire retardant- suitable for aircraft fuselage and interior applications
- High hot/wet property retention- higher service temperature to enable a wide range of aircraft applications
- Improved UV resistance- no discoloration compared to epoxies
- Good thermal resistance- acceptable for high temperature areas

- Excellent compression after impact performance with Epsilon 99900 binder

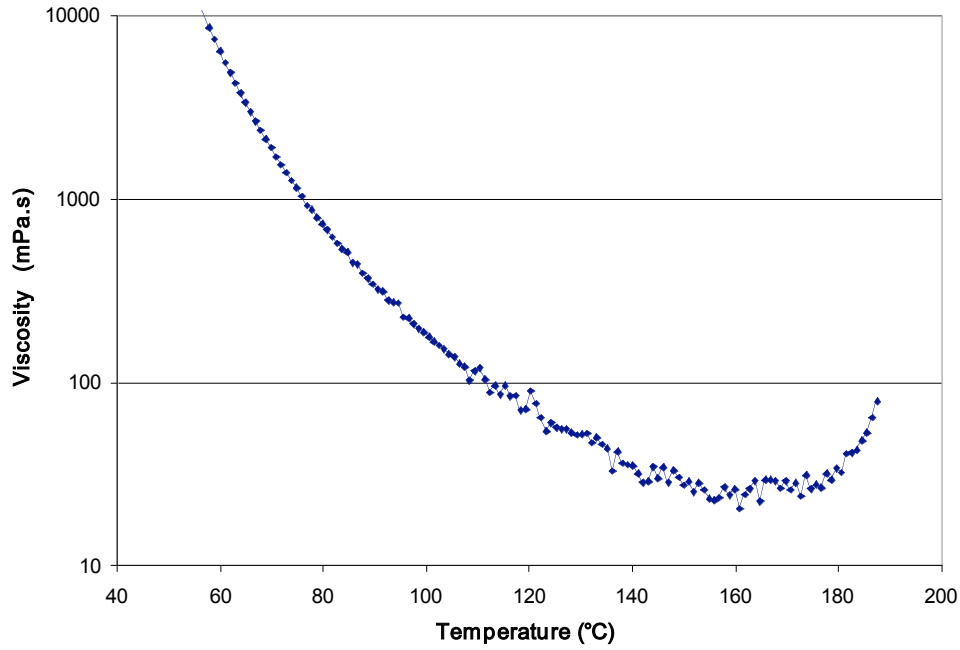
**STORAGE**

Shelf life: 6 months minimum at room temperature

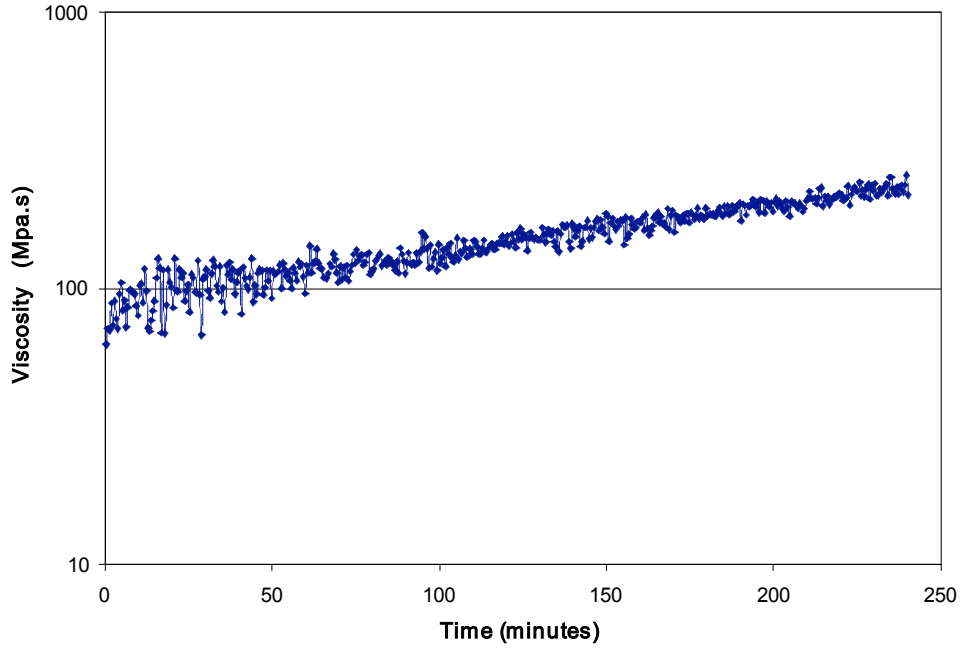
**PROCESSING**

**Viscosity Profile of Epsilon® 99100 Resin**

Heat up rate 2°C/min



**Isothermal Viscosity of Epsilon® 99100 Resin at 110°C  
(230°F)**



**RTM Process:**

Injection temp: 110°C (230°F)  
Injection pressure gradient: 1-2 bars  
Injection viscosity: <100 mPa.s  
Cure temperature and time: 3 hours @ 185°C (365°F)  
Cure pressure: 6-7 bars  
Cure ramp rate: 0.5°C/min (1°F/min) to cure temperature

**VARTM Process:**

Injection temperature: 110°C (230°F)  
Injection pressure gradient: 1 bar (full vacuum)  
Cure temperature and time: 3 hours @ 185°C (365°F)  
Cure pressure: 0.7 – 1.0 bar vacuum  
Cure ramp rate: 0.5°C/min (1°F/min) to cure temperature

**PROPERTIES**

**Uncured Resin Properties**

Viscosity at:  
93°C (200°F): 270mPa.s  
110°C (230°F): 104mPa.s  
121°C (250°F): 65mPa.s  
Minimum Viscosity: 25mPa.s at 160°C (320°F)  
Heat of Cure (DSC): 357J/g

**Cured Resin Properties**

Density: 1.22g/cm<sup>3</sup>  
Weight change – 72 hours/boiling water: 2.0%  
Tg Onset Dry: 187°C (369°F)  
Tg Onset – 72-hours boiling water: 162°C (324°F)  
Flexural Strength: 119MPa (17.3ksi)  
Flexural Modulus: 4.5GPa (0.65Msi)

**Composite Properties – with Epsilon 99900 Binder**

Epsilon 99900 binder may be used at up to 10% loading.

Fiber preforming 30 min at 120°C (248°F) under vacuum

Physical Properties

Reinforcement: Toho Tenax HTS 12k carbon fiber UD Fabric 300g/m<sup>2</sup>

Tg Onset Dry: 190°C (374°F)

Tg Onset – 72-hours boiling water: 160°C (320°F)

Mechanical Properties

Reinforcement: Toho Tenax HTS 12k carbon fiber UD Fabric 300g/m<sup>2</sup>

0° Compression Strength, Room Temp 1188MPa (172ksi)

Interlaminar Shear Strength, Room Temp 82MPa (11.9ksi)

Interlaminar Shear Strength 120°C (248°F) 61MPa (8.8ksi)

Compression after impact 30J impact 250MPa (36ksi)

Flammability Properties

Reinforcement: Toho Tenax HTS 12k carbon fiber NCF 270g/m<sup>2</sup>  
quasi-isotropic

With Epsilon 99900 binder at 4% loading

Vertical Burn FAA14 CFR 25.853

Value

Requirement

Extinguishing time (secs):

10.0

15 maximum

Burn length (cm): 1.3

15.2

Drip extinguishing time (secs):

No Drips

3 maximum

**Handling Precautions**

Do not handle or use until the Material Safety Data Sheet has been read and understood.

For industrial use only.

**General:**

As with most resin systems, use this product with adequate ventilation. Do not get in eyes or on skin. Avoid breathing the vapors. Wash thoroughly with soap and water after handling. Empty containers retain product residue and vapors, so obey all precautions when handling empty containers.

**CAUTION!** Epsilon 99100. This material may cause eye and skin irritation or allergic skin reaction.

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