ResinFormulators
INNOVATIVE MATTERS

HIGH-TG EPOXY VALIDATION CHECKLIST

Engineering Controls for
Thermal Stability, Structural Integrity
& Launch Survival

Advanced Materials Lab | Custom Formulations | Tg Validation

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WHY TG VALIDATION MATTERS.

In aerospace environments, exceeding an epoxy's Glass Transition Temperature (Tg) is not simply a performance issue — it is a structural risk threshold.

WHEN TEMPERATURES APPROACH OR EXCEED TG:

- ☐ Storage modulus drops sharply
- ☐ Load transfer efficiency is reduced
- ☐ CTE increases significantly
- ☐ Long-term creep risk increases
- ☐ Bondline stiffness decreases

This checklist is designed to help aerospace engineers validate whether their selected epoxy system is truly suitable for mission-critical thermal conditions.

HIGH-TG EPOXY VALIDATION CHECKLIST

1

OPERATING TEMPERATURE MARGIN VALIDATION

- [ ] What is the maximum sustained operating temperature?
- [ ] What is the maximum transient temperature (launch, friction heating, solar exposure)?
- [ ] Does Tg exceed maximum operating temperature by at least 25–30°C?
- [ ] Have thermal cycling extremes been factored in (e.g., −150°C to +150°C in orbit)?

Engineer Note:
For structural aerospace bonding, Tg should exceed maximum expected operating temperature by a sufficient safety margin to prevent modulus degradation.

2

CURE SCHEDULE VALIDATION

- [ ] Has the recommended cure schedule been followed exactly?
- [ ] Has post-cure been implemented where required?
- [ ] Has Tg been verified after cure using DMA or DSC?
- [ ] Is the cure process repeatable in production?

Warning:
Incomplete cure can significantly reduce Tg versus datasheet values.

3

THERMAL EXPANSION COMPATIBILITY

- ☐ What is the CTE of the bonded substrates?
- ☐ What is the CTE of the epoxy above Tg?
- ☐ Has CTE mismatch been evaluated for delamination risk?
- ☐ Are bonded materials composite-to-metal or metal-to-metal?

Risk Factor:
Above Tg, epoxy expansion rate may increase dramatically, elevating shear stress at bonded interfaces.

4

BONDLINE STRUCTURAL PERFORMANCE AT TEMPERATURE

- ☐ Has lap shear strength been tested at elevated temperatures?
- ☐ Does the adhesive maintain required psi at operating temperature?
- ☐ Has creep behavior been evaluated under sustained load?
- ☐ Has modulus vs temperature curve been reviewed?

Engineer Note:
Structural adhesives must retain sufficient modulus at temperature to ensure effective load transfer.

5

THERMAL CYCLING DURABILITY

- ☐ Has the system been tested under repeated thermal cycling?
- ☐ Are fatigue effects at the bondline understood?
- ☐ Has bondline geometry been optimized for stress distribution?
- ☐ Is the epoxy rated for extreme aerospace temperature swings?

Engineer Note:
Thermal fatigue is cumulative.
Repeated cycling near Tg accelerates interface degradation.

6

LAB TESTING & VALIDATION

- ☐ Has Tg been validated via Dynamic Mechanical Analysis (DMA)?
- ☐ Has Differential Scanning Calorimetry (DSC) confirmed cure completeness?
- ☐ Has modulus vs temperature data been reviewed?
- ☐ Is custom formulation required to achieve higher Tg?

WHY INDEPENDENT VALIDATION MATTERS

1. Datasheet values are generated under controlled laboratory conditions.
2. Real-world aerospace environments rarely match those conditions.

YOU SHOULD CONSIDER THIRD-PARTY OR IN-HOUSE VALIDATION IF:

- Your program involves flight hardware
- Operating temps approach published Tg
- Cure conditions vary in production
- You are transitioning from prototype to full production
- You are qualifying a new supplier

RESIN FORMULATORS ADVANCED MATERIAL TESTING SERVICES

Resin Formulators' advanced material testing services take the guesswork out of epoxy validation. Our in-house lab offers Tg validation via DMA and DSC, cure schedule optimization, and more. From custom formulation development to certified testing, we can provide a solution for your engineering challenges.

REQUEST A FREE CONSULTATION

EXPLORE RESIN FORMULATORS HIGH-TG SOLUTIONS

RF 5407 / RF 24
Aluminum oxide filled for superior thermal conductivity. Achieves Tg > 150°C post-cure; optimized for high-temperature potting.

RF 6110
Structural adhesive (Tg 108°C) maintaining >2,100 psi lap shear at 220°F. Engineered for reliable load transfer at elevated temperatures.

RF 6004 Mod 1
Advanced composite resin with Tg up to 228°C. Supports multiple curing agents for customizable schedules and maximum thermal stability.

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NEED HELP VALIDATING YOUR HIGH-TG EPOXY?

RESIN FORMULATORS' IN-HOUSE ADVANCED MATERIAL LAB TESTING SERVICES PROVIDE:

- ✓ Tg validation via DMA and DSC
- ✓ Cure schedule optimization
- ✓ Custom high-Tg formulation development
- ✓ Aerospace-grade material expertise

REQUEST A FREE CONSULTATION

Speak directly with an Application Development Engineer to review your thermal requirements and validation strategy.

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