

R9-351 is a hot-melt fast-curing, flame-retardant epoxy resin system specifically developed for the manufacture of high performance composite components. This advanced formulation is **halogen-free**, ensuring enhanced environmental compatibility and improved safety standards. The system is engineered to meet the fire performance requirements of **FAR 25.853, Appendix F, Parts I, IV and V**, making it suitable for applications requiring stringent regulatory compliance in the aerospace and transportation industries.

R9-351 is suitable for autoclave, press and VBO curing processes, and it is supplied on a range of lightweight surface plies and some heavier weight reinforcements.

TYPICAL APPLICATIONS



AEROSPACE



INDUSTRIAL



RAIL

FEATURES



GOOD TACK AND HANDLEABILITY



FAST CURE



MULTIPLE CURING CONDITIONS



GOOD MECHANICAL PROPERTIES



HALOGEN-FREE

SHELF LIFE



OUT LIFE
4 weeks @ 21 °C



STORAGE LIFE
12 months @ -18°C

FST PERFORMANCE



MEET FAR 25.853, APP. F, PART I, IV, V

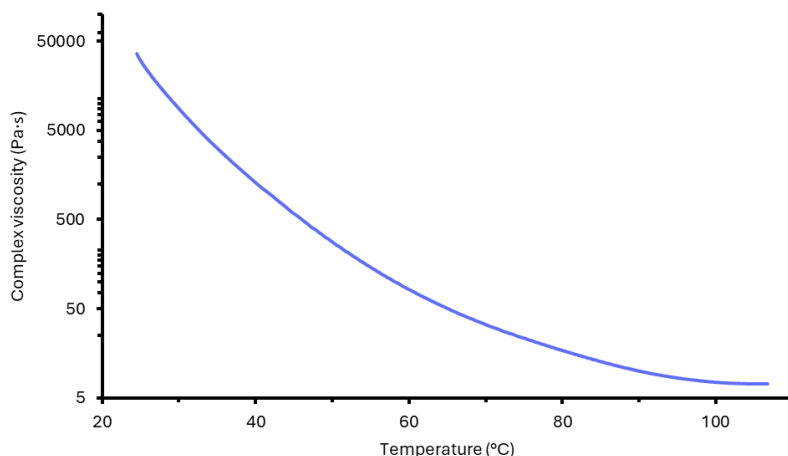


MEET EN45545-2: 2020

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MATRIX PROPERTIES

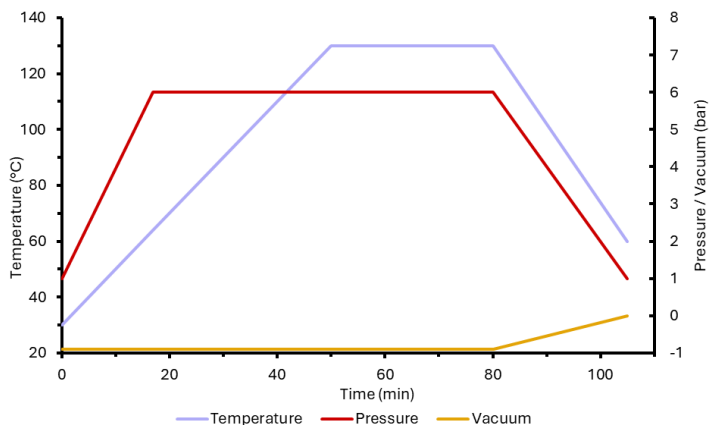
Resin viscosity: ramp rate = 2 °C/min, $v = 10$ rad/sec.



CURING CONDITIONS

Below there is the suggested standard autoclave cure cycle. For advice on different cure cycles for specific components, please consult Microtex Composites technical service.

Recommended Autoclave Cure Cycle ^[1,2]			
Time (min)	Temp. (°C)	Time (min)	Pressure (bar)
0	30	0	1
50	130	17	6
80	130	80	6
105	60	105	1



^[1] Temperature must be measured by the lagging thermocouple attached to the part.

^[2] Vacuum bag pressure: -0.9 bar.

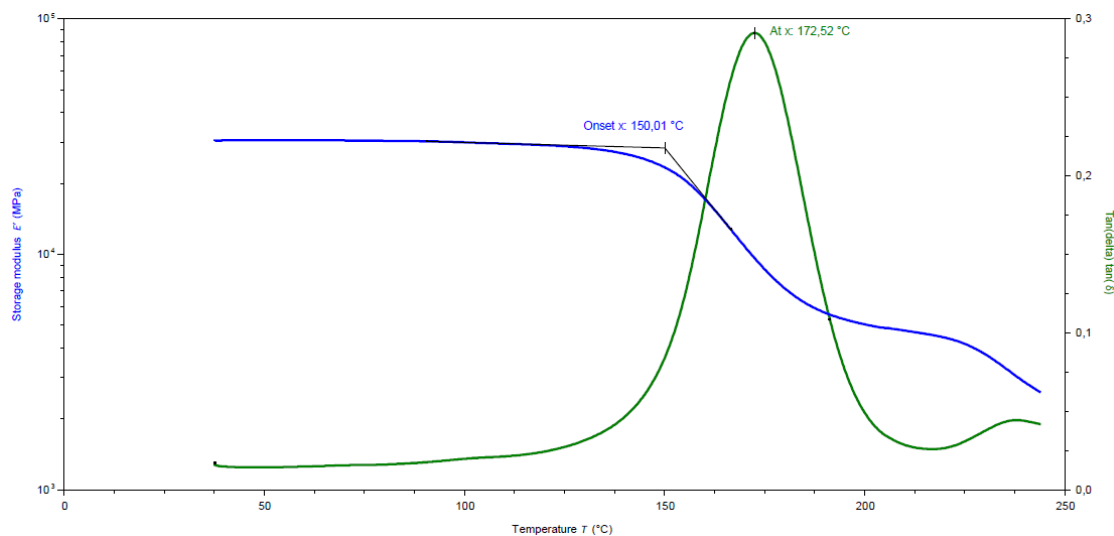
Additionally, **R9-351** is suitable for curing by VBO and press processes. For recommended cure cycles and specific processing conditions, please consult Microtex Composites Technical Service.

THERMAL PROPERTIES

The table below summarizes indicative average thermal properties of laminates based on **R9-351** resin reinforced with 200 gsm carbon fiber 3K twill weave reinforcement at 45% resin content by weight. Laminates were cured in autoclave 30 min at 130°C (heating rate 2°C/min), and 6 bar of pressure.

R9-351	GG200T (T300) [3]
Autoclave Cure Cycle	30'@130°C 6 bar, ramp 2°C/min
Tg (DMA) Onset – ASTM D7028	150 °C
Tg (DMA) Peak Tan Delta – ASTM D7028	172 °C

[3] Carbon fabric 200 gsm twill 2/2 3K, 45% resin content.



ALTERNATIVE CURE CYCLES

R9-351 can be cured using different cure cycles depending on the specific application and processing requirements. In order to achieve the maximum Tg, a high-temperature post-cure is generally recommended. However, cure response and resulting thermal-mechanical properties can vary depending on processing conditions, laminate thickness, and equipment capability.

For detailed guidance on alternative cure cycles or process optimization, please consult Microtex Composites Technical Service.

CARBON FABRIC FST PROPERTIES

Laminates made of carbon fiber impregnated with **R9-351** epoxy resin meet:

- **EN 45545-2: 2020** - ISO 5658-2 (*Critical Flux at Extinguishment*), ISO 5660-1 (*Maximum Average Rate of Heat Emission*), ISO 5659-2 (*optical smoke density*), and TC 45545-2 (*gas toxicity*).
- **FAR 25.853, App. F** - Part I (a) (1) (ii) (*12 sec. vertical burn*), Part IV (*heat release rate*), and Part V (*optical smoke density*).
- **UL-94: 2014**

The table below summarizes the indicative average FST properties of laminates based on **R9-351** resin reinforced with carbon fiber at 45% resin content by weight. Flammability, heat release rate, and optical smoke density tests were performed on laminates with an approximate thickness of 2.0 mm. Laminates were cured for 30 minutes at 130°C (heating rate: 2°C/min), and 6 bar of pressure.

Property	Test Method	R9-351	Required
		Value	Value
PHRR [KW/m ²] ^[4]	FAR 25.853, App. F, Part IV	40	≤ 65
THRR 2 min [KW·min/m ²] ^[5]		37	≤ 65
Maximum Optical Density ^[6]	FAR25.853, App. F, Part V	59	≤ 200

^[4] Peak Heat Release Rate expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence), is ± 1,6 kW/m².

^[5] Total Heat Release during first 2 min expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence), is ± 1,6 kW min/m².

^[6] Smoke optical density expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence) is ± 3,8.

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GLASS FABRIC FST PROPERTIES

Laminates made of glass fiber impregnated with **R9-351** epoxy resin meet:

- **EN 45545-2: 2020** - ISO 5658-2 (*Critical Flux at Extinguishment*), ISO 5660-1 (*Maximum Average Rate of Heat Emission*), ISO 5659-2 (*optical smoke density*), and TC 45545-2 (*gas toxicity*).
- **FAR 25.853, App. F** - Part I (a) (1) (ii) (*12 sec. vertical burn*), Part IV (*heat release rate*), and Part V (*optical smoke density*).
- **UL-94: 2014**

The table below summarizes the indicative average FST properties of laminates based on **R9-351** resin reinforced with glass fiber at 42% resin content by weight. Flammability, heat release rate, and optical smoke density tests were performed on laminates with an approximate thickness of 1.6 mm. Laminates were cured for 30 minutes at 130°C (heating rate: 2°C/min) either in an autoclave (6 bar pressure) or by VBO.

Property	Test Method	R9-351 Autoclave	R9-351 VBO	Required
		Value	Value	Value
PHRR [KW/m ²] ^[4]	FAR 25.853, App. F, Part IV	38	38	≤ 65
THRR 2 min [KW·min/m ²] ^[5]		37	43	≤ 65
Maximum Optical Density ^[6]	FAR25.853, App. F, Part V	74	83	≤ 200

^[4] Peak Heat Release Rate expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence), is ± 1,6 kW/m².

^[5] Total Heat Release during first 2 min expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence), is ± 1,6 kW min/m².

^[6] Smoke optical density expanded uncertainty with a coverage factor of K= 2 (95% of level of confidence) is ± 3,8.

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MECHANICAL PROPERTIES

The table below summarizes indicative average mechanical properties of laminates based on **R9-351** resin reinforced with carbon and glass fibers. Carbon fiber laminates were manufactured using 200 gsm 3K twill weave reinforcement at 45% resin content by weight, while glass fiber laminates were produced using 296 gsm 8H satin weave reinforcement at 42% resin content by weight.

R9-351		GG200T^[7] (T300)	GG200T^[7] (T300)	GG200T^[7] (T300)	VV296 S8^[8]
Curing Process		Autoclave 30'@130°C 6 bar	VBO 30'@130°C	Press 11'@150°C 12 bar	Autoclave 30'@130°C 6 bar
Property	Test Method	Value*	Value*	Value*	Value*
0° Tensile Strength [MPa]	ASTM D3039	966	987	883	552
0° Tensile Modulus [GPa]		72	73	72	35
0° Compression Strength [MPa]	ASTM D6641	933	825	764	722
0° Compression Modulus [GPa]		74	74	73	35
± 45° IPSS (MPa)	ASTM D3518	107	-	-	105
± 45° IPSS Modulus (GPa)		5.2	-	-	5.8
0° Flexural strength [MPa]	ASTM D790	1191	1040	1046	755
0° Flexural modulus [GPa]		65	55	62	55
Interlaminar shear strength [MPa]	ASTM D2344	77	61	76	74

* Test conditions: room temperature, dry. Normalized values at 55% volum fiber .

^[7] Carbon fabric 200 gsm twill 2/2 3K, 45% resin content.

^[8] Glass fabric 296 gsm 8H satin EC6 68, 42% resin content.

EXOTHERMIC HAZARD

This matrix system can undergo severe exothermic heat up during the curing process if incorrect procedures are followed. Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are properly executed, especially when molding solid laminates with high thickness.

The risk of exotherm increases with lay-up thickness and increasing of temperature cure. It is strongly recommended that the user identifies a safe cure cycle through trials that are representative of all the relevant processing parameters. It is also important to recognize that the model or tool material and its thermal mass, combined with the insulating effect of breather/bagging materials can affect the risk of an exotherm. Please contact our technical department for further information on the exotherm behavior of these systems.

PRECAUTIONS FOR USE

The usual precautions when handling uncured resins and fibrous materials should be observed, and a Safety Data Sheet is available for this product.

SDS Reference Codes: **R9-351**: SiS-499

AVAILABILITY

R9-351 series prepregs are available in a wide range of reinforcing fabrics, including carbon, aramid, glass and special fabrics.

STORAGE CONDITIONS

This prepreg should be stored as received in a cool dry place or in a refrigerator.

After removal from refrigerated storage, prepreg should be allowed to reach room temperature before opening the polyethylene bag, thus preventing condensation (a full roll in its packaging can take more than 1 day).

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