

Product Description

NONA resins are specially formulated, high-performance epoxy materials designed to facilitate a room-temperature cure when combined with appropriate low-cost tooling and complementary layup design. The heat of the epoxy is released strategically during the cure allowing for uniform heating through the entire composite thickness. No heat is added, and the part can typically achieve a full cure in less than two hours. No post-cure is required, and the final material system has a 350°F service temperature.

NONA resins are designed to enable both high-volume rapid-cure production and large-scale part production that is free from traditional composite curing infrastructure. Large, single-piece structures can be made on-site, in the field, with limited start-up and capital investment. Additionally, because of the low infrastructure costs and elimination of process-flow bottlenecks, multiple production lines can be set up in parallel, allowing for dramatically increased throughput with limited additional cost. The tooling required is very inexpensive, reusable, and capable of producing tight tolerances without any post-cure machining or finishing. Cost savings is realized through reduced capital investment (ovens, autoclaves, and tooling) and value engineering of the manufacturing process. NONA provides increased throughput, simplified fabrication logistics, reduced energy needs, low equipment and facility maintenance costs, and limited touch time.

This material is equally suitable for manufacturing composite tooling, prototyping, and structural applications at all scales.

Features & Benefits

- Two-part infusion resin system
- Six-month shelf life when stored at 20°C (68°F)
- Two-hour pot life
- Room temperature 20-25°C (68-77°F) cure
- No heat added during cure
- Fully cured in two hours with no-post cure required
- Consistent cure throughout entire part geometry
- Vacuum-bag-only pressure during cure
- 350°F service temperature
- Low void content (<0.5%) in cured laminate
- High fiber volume (54-58% typical)
- Mechanical properties comparable with other autoclave cured 177°C (350°F) epoxies
- Can be used with thin laminates (4 plies) or thick laminates (>300 plies)
- Compatible with both glass and carbon fibers appropriately sized for epoxy
- Uses low-cost tooling
 - Can meet ± 0.020 inch tolerances directly from master mold
 - No machining required of the final composite part

Resin Properties

Density	1.23 g/cc
T _g dry	195°C (383°F) – E' Onset
	219°C (426°F) – Peak tanδ
T _g wet ^a	172°C (342°F) – E' Onset
	200°C (392°F) – Peak tanδ
Viscosity at 30°C (86°F) ^b	273 cPs (t=0), 600 cPs (t=60 min)
Shelf-life	6 months
Standard cure ^c	2 hrs at 25-30°C, 2 hour cool down
Degree of cure achieved with standard cure ^d	>90%

^a Two day water boil ^b Longer potlife if resin temp maintained at 20°C (68°F)

^c The part temperature will reach 160°C (320°F) to 190°C (374°F), but no heat is added to achieve this

^d SBS, Degree of cure, and T_g were checked after standard NONA cure and compared against RT-177 material that went through an oven cure cycle (2 hr at 177°C [350°F]) confirming no difference in properties – Postcure unnecessary

Mechanical Properties

Property	Ply Schedule	Test Temperature, Specimen Condition			
		-85 °C (-65 °F) dry	21 °C (70 °F) dry	82 °C (180 °F) dry	82 °C (180 °F) wet
Tensile strength, ksi (ASTM 3039)	[(0/90)] ₁₅	84.0	97.6		105.4 ^f
Tensile modulus, msi (ASTM 3039)	[(0/90)] ₁₅	10.38	10.21		9.68 ^f
Compressive strength, ksi (ASTM D6641)	[(0/90)] ₁₅		64.4	60.2	30.7 ^f
Compressive modulus, msi (ASTM D6641)	[(0/90)] ₁₅		10.29	10.16	9.82 ^f
Short beam shear, ksi (ASTM D2344)	[(0/90)] ₃₂		8.42		6.46 ^e
In-plane shear strength, ksi (ASTM D3518/D3518M-94(2007))	[(±45)] ₈	10.2	6.17		3.22 ^e
In-plane shear modulus, msi (ASTM D3518/D3518M-94(2007))	[(±45)] ₈	0.931	0.693		0.452 ^e
Open hole tension strength, ksi (ASTM D5766/5766M-11)	[(±45), (0/90)] _{4s}	42.1	46.8		51.9 ^f
Open hole compression strength, ksi (ASTM D6484-09)	[(±45), (0/90)] _{5s}		43.1		27.5 ^f
Compression after impact strength ^g , ksi (ASTM D7137/D7137M-12)	[(±45), (0/90)] _{5s}		26.7		

^e Two day water boil ^f Seven day water boil ^g Impact load 1500 in*lb/in

All test panels were made with SGP 193-P carbon (IM7 carbon, 6k tow, 193 g/m², plain weave). All test panels were NONA cured, then oven cured for 2 hrs at 177°C (350°F) under vacuum bag only pressure to confirm identical degree of cure – See note (d) under resin properties. Small variations in fiber volume (average 54%) - Data not normalized

NCTS-4 0414