TAKPOXY-219
EPOXY NOVOLAC RESIN

1. Product description

This is a two-component, high-temperature thermosetting epoxy system. Component A is based on a DGEBA epoxy resin blended with 20% novolac epoxy resin. The resin blend is specified at an **epoxy equivalent weight (EEW) of 210 g/eq**. Component B is a **modified aromatic polyamine** curing agent. The cured network is intended for structural bonding, encapsulation, tooling, electrical insulation, and protective coating applications where elevated-temperature performance is required.

The stated service capability is **up to 195 °C**, subject to validated continuous/intermittent exposure limits, thermal cycling, applied stress, chemical environment, film or bond-line thickness, and the actual post-cure. The 195 °C statement should not be interpreted as an unconditional continuous-use rating until supported by long-term aging and property-retention testing.

2. Formulation and mix-ratio basis

Item	Component A: resin blend	Component B: hardener
Chemistry	DGEBA + 20% novolac epoxy resin	Modified aromatic polyamine
Designation	Epoxy resin blend	Amine curing agent
Equivalent-weight input	EEW = 210 g/eq	AHEW = 90 g/eq*
Recommended mix ratio by weight	100	42.9*
Stoichiometric basis	100 parts	42.9 parts by weight; calculated as 100 × 90 / 210
Mix-ratio tolerance	Target ±2% by weight	Target ±2% by weight

*Using the specified EEW and AHEW, the nominal stoichiometric ratio is **100 parts by weight of Component A to 42.9 parts by weight of Component B**, or **2.33:1 by weight**. This is calculated as 100 × 90 / 210 = 42.86. The final formulation may require an intentional stoichiometric offset for toughness, cure speed, chemical resistance, or high-temperature retention; any such offset must be documented by the formulator. The stated EEW and AHEW should be confirmed by the latest certificates of analysis before production release.

3. Recommended processing and cure

Parameter	Recommended starting point	Verification requirement
Conditioning before mixing	23 ± 2 °C	Record component temperatures
Mixing	3–5 min, low-shear; scrape vessel walls	Avoid entrained air and localized exotherm
Degassing	5–15 min under vacuum, if compatible	Confirm no foaming or volatile loss
Working temperature	20–30 °C	Higher temperatures reduce viscosity and pot life
Initial cure	2–4 h at 80 °C	Establish by DSC/DMA and gel-time testing
Post-cure	2 h at 120 °C + 2 h at 160 °C, with controlled ramp	Optimize for Tg and thermal aging
Suggested final post-cure for 200 °C use	2 h at 180 °C after the above schedule	Do not exceed substrate or assembly limits
Maximum mixed-mass batch	Establish by adiabatic/exotherm testing	Depends strongly on batch size and container geometry

These are starting conditions only. A qualified process engineer should establish the actual cure window using differential scanning calorimetry, gel time, DMA, hardness development, and property-retention testing.

Thermal Properties

Property	Test Method	Typical Value
Glass Transition Temperature (Tg), DMA tan δ	ASTM D7028 / D4065	170 – 195 °C
Glass Transition Temperature (Tg), DSC	ASTM E1356	160 – 185 °C
Heat Deflection Temperature (HDT)	ASTM D648	150 – 180 °C
Coefficient of Thermal Expansion, below Tg	ASTM E831	55 – 65 ppm/°C
Coefficient of Thermal Expansion, above Tg	ASTM E831	150 – 200 ppm/°C
Decomposition Onset (5% weight loss, TGA)	ASTM E1131	350 – 380 °C
Thermal Conductivity	ASTM E1461	~0.20 W/m·K

Mechanical Properties (Room Temperature, Unfilled)

Property	Test Method	Typical Value
Tensile Strength	ASTM D638	70 – 90 MPa
Tensile Modulus	ASTM D638	3.0 – 3.5 GPa
Elongation at Break	ASTM D638	2 – 5 %
Flexural Strength	ASTM D790	110 – 140 MPa
Flexural Modulus	ASTM D790	3.2 – 3.8 GPa
Compressive Strength	ASTM D695	110 – 140 MPa
Izod Impact Strength (Notched)	ASTM D256	15 – 25 J/m
Fracture Toughness (K1c)	ASTM D5045	0.6 – 0.9 MPa·m^0.5
Hardness (Shore D)	ASTM D2240	85 – 90

Physical Properties

Property	Test Method	Typical Value
Cured Density	ASTM D792	1.20 – 1.25 g/cm^3
Water Absorption (24 h, 23 °C)	ASTM D570	0.1 – 0.3 %
Cure Shrinkage (Volumetric)	—	1 – 3 %

Electrical Properties

Property	Test Method	Typical Value
Dielectric Strength	ASTM D149	16 – 20 kV/mm
Volume Resistivity	ASTM D257	10^{15} – 10^{16} Ω·cm
Dielectric Constant @ 1 MHz	ASTM D150	3.8 – 4.5
Dissipation Factor @ 1 MHz	ASTM D150	0.01 – 0.03

Formulation Notes

- The epoxy novolac fraction is the primary driver of Tg/HDT and chemical resistance above what an unmodified DGEBA/amine system would provide (~120–140 °C HDT); the higher-functionality network requires the full 180–200 °C post-cure to develop.
- Under-curing or omitting the post-cure step will leave Tg and mechanical properties well below the values listed above.
- The exotherm from a stoichiometric aromatic-amine cure can be significant in thick sections; void content and cure uniformity in mass castings will affect real-world mechanical performance more than small formulation adjustments.
- Values assume a void-free, fully cured, unfilled casting. Fillers, reinforcement, or process defects (voids, incomplete wet-out) will shift these numbers.

6. Chemical and environmental resistance — expected performance

The cured system is expected to show good resistance to water, dilute acids, dilute alkalis, salts, oils, and many hydrocarbons. Performance is formulation- and exposure-dependent. Strong oxidizing acids, concentrated acids or alkalis, selected ketones, chlorinated solvents, polar aprotic solvents, and prolonged hot-water exposure may cause swelling, plasticization, loss of adhesion, or degradation. Test representative coupons at the intended temperature and concentration before approving service.

7. Application guidance

Surfaces should be clean, dry, and free of oil, release agent, dust, and weak oxide. Metals should normally be abraded or grit-blasted and solvent-wiped with a compatible solvent. Do not apply to a wet or actively outgassing substrate. Use accurate weighing, thorough low-shear mixing, and controlled cure. Avoid thick masses unless the exotherm has been characterized, because epoxy/amine reactions are exothermic and can produce excessive heat.

8. Packaging, storage, and handling

Store Components A and B separately in tightly closed, original containers at 5–25 °C, protected from moisture, direct sunlight, ignition sources, and contamination. Allow cold material to reach processing temperature before opening where condensation could occur. Do not return mixed material to the original containers. Follow the accompanying SDS, use suitable chemical-resistant gloves and eye protection, and provide local exhaust ventilation where vapors, aerosols, or heated material may be generated.