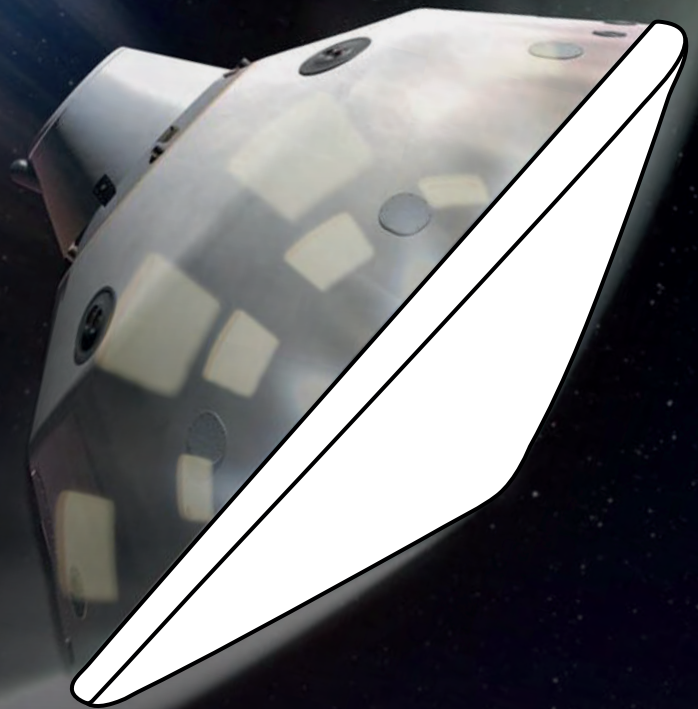


MICHELIN

RESICARE

Beyond resin, innovation for life.



AEROSPACE
& DEFENSE



Resi4 ABLATION

A unique, **non-toxic¹** & **renewable-carbon-based**, araminolic resin engineered for ablative protection offering high charring performance under heat flux.

Atmospheric re-entry bodies

Heat shields

Propulsion nozzles

Fuselage structure parts

Thermal protection



MICHELIN

Resi4 ABLATION

Araminolic resins provide a sustainable alternative to conventional thermosetting phenolics, formulated with unique, bio-based monomers that replace **formaldehyde** with **aromatic aldehydes** and **polyphenols**.

Resi4 ABLATION is a unique, bio-based² and formaldehyde-free araminolic resin with high temperature properties. While reducing use of CMR substances in your value chain, Resi4 ABLATION contributes to your sustainable roadmap, achieving CO₂ emission reduction & sovereignty goals with local sourcing.

Benefits and characteristics



High temperature resistance for aerospace and defense applications

Coke rate³ **50% - 55%**



Solving toxicity issues in phenolics resins for your supply chain

Securing your long-term right to operate, independent of regulatory evolution

REACH compliant

Monomers **free of formaldehyde** and **phenol** by design

Free of CMR and endocrine disruptors

Water-based technology



Supporting your sovereignty, raw material procurement and sustainability strategies

100% bio-based formulation²

Bio-based raw materials: **5HMF monomer**

Low CO₂ emissions²

European sourcing²

Advantages



No acute toxicity & serious health hazard pictograms VS Formaldehyde, Phenol, Furfuraldehyde.



Acute toxicity



Serious health hazard



Resi4 ABLATION
CO₂ emissions² (CO₂kg / kg)



⁽¹⁾Formulated without chemicals meeting SVHC criteria (Substance of Very High Concern) as defined by European Chemicals Agency in date of 01/01/2026.

⁽²⁾Upon availability of our sugar-based monomers industrial demonstrators in 2027. Two of our first main industrial monomers demonstrators are based in France. The bio-based content is based on ISO 16620 guidelines based on internal data. CO₂ emission's preliminary figures are based on internal data, compliant with ISO 14044 guidelines. The variability of high and low values is depending of sugar sourcing.

⁽³⁾Coke rate - residu at 850°C > 50% (TGA - 10°C/min - nitrogen method).

Technical Data Sheet

Resi4 ABLATION

Applications:

Atmospheric re-entry bodies

Heat shields

Propulsion nozzles

Fuselage structure parts

Product: Resi4 ABLATION.

Description: Aqueous araminolic resin.

Presentation form: Red - brown liquid.

Benefits: Formol-free, phenol-free formulation. High coke rate.

Main application: Molded composites with high thermal stability.

Main method of implementation: Fiber impregnation, drying to evaporate the solvent (water), then thermocompression molding. The drying time and curing conditions during molding will need to be adapted to the product.

Main cross-linking: Thermocompression.

Duration of use and storage: 10 days at room temperature and 30 days at 4°C (Viscosity < 1500cP). Store in the freezer to extend shelf life (until 6 months). The viscosity can be adjusted by dilution in water or ethanol.

Handling precautions: This product must be used in accordance with the instructions in the Safety Data Sheet.

Characteristics of liquid resin

Property	Method	Unit	Measure
Viscosity at 20°C	Brookfield Viscometer	mPa.s	200 - 400
Dry matter	Moisture Analyzer – 100°C	%	50 - 52
pH	pH meter	-	11 - 12
Density	Pycnometer	-	1,25
Onset crosslinking	DSC – 10°C/min	°C	100 - 110
Peak temperature crosslinking	DSC – 10°C/min	°C	130 - 150
Enthalpy	DSC – 10°C/min	J/g	200 - 350
Coke rate – residu at 850°C	TGA – 10°C/min – nitrogen	%	> 50

Cross-linking method: The curing conditions must be adapted according to the size, geometry and composition of the piece.

Destruction and disposal: Cleaning of liquid resin with water. Disposal with basic aqueous waste.

Additional information: For further information, please reach out to us through the contact form on our website (<https://resicare.michelin.com/contact/>).

Did you know? REACH regulation focus

✓✓ I've heard about the REACH regulation...
Should I really worry about it? Does it impact my business?

✓✓ Yes! Regarding the European directive 2004/37/EC, employers must reduce the use of CMR substances in the workplace. This must be done by replacing the hazardous substance with a safer alternative, if technically feasible!

✓✓ Got it... Time to improve our chemistry for a safer future!

Sent by Pioneer customer

MICHELIN

RESICARE

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