FILAVA™ for automotive-related body structural applications

A revolutionary fibre reinforcement for high-performance composites in the automotive industry

Main dynamics

The current major drivers and the most important challenges ahead for the global automotive industry are the need for higher-performance vehicles, lower emissions and better fuel efficiency to meet tighter environmental regulations, increased recyclability, higher auto-body structural integrity and vehicle crashworthiness ensuring passenger safety.

Our solutions

Due to their mechanical and thermal properties, excellent corrosion resistance, lightweight and dimensional stability, fibre reinforced polymers (including thermoplastics) made with **ISOMATEX** products (under trade-mark **FILAVA**™) offer high stiffness-to-weight and strength-to-weight ratios. Thanks to a high energy-absorption rate, composites made with **FILAVA** ™ also assure better integrity of a vehicle's passenger compartment than carbon fibre reinforced polymers, helping to reduce the risk of serious injury to its occupants.

An experimental study has recently been conducted by **ISOMATEX** in close cooperation with a well-known French-based research centre, that is dedicated to improving advanced composite materials and processes for the automotive industry. The aim of this project was to investigate the mechanical resistance of an innovative composite made with **FILAVA**™ in high-stress areas during complex stress tests and to understand the overall behaviours and failure mechanisms, which will aid in the development of optimally-designed, lightweight structures used in automotive and aircraft structural components.

The results show that composites made with **FILAVA**™ have mechanical properties comparable to carbon fibre polymers but with significantly higher elongation at break.

Although carbon fibres are the most widely used reinforcements in high-performance applications and are commonly used wherever high strength-to-weight ratio and rigidity are required e.g. in the automotive, aerospace and civil engineering sectors, its production is highly energy intensive. Moreover, they are not only less impact-resistant but can also experience galvanic corrosion in contact with metal.

In contrast to carbon fibres, **FILAVA**™ is a stable mineral product, providing a large list of solutions for each application, allowing it to meet manufacturers' requirements in terms of cost-performance ratio as well as anticipating the demand of end-users for sustainable development and total recyclability.

High mechanical properties such as tensile strength and Young modulus (elasticity) as well as resistance to high temperatures and chemical resistance offer a unique combination of properties. This makes **FILAVA**™ a favourable substitute to carbon fibres as well as to S and R glass fibres while being completely compliant with the technical requirements of high-end applications.

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Application : Automotive-related body structural parts and components

Meeting automotive industry high constraint requirements with lightweight materials

Key benefits

The main properties of **FILAVA**™ are:

- Tensile strength of virgin filaments and strands (direct roving) similar to carbon fibres
- Significantly greater elongation at break than carbon fibres
- Better resistance in acid solution than carbon or glass fibres
- Outstanding surface quality for woven fabrics
- Good wettability and high infusion for complex shapes thanks to tailor-made sizings that are compliant to a large list of organic (polymeric) matrix materials
- Better resistance than glass or aramid fibres at high or very low temperatures
- Better elasticity (Young modulus) than glass fibres
- High thermal and acoustical insulation properties
- No galvanic or metal corrosion particularly in high-moisture environments
- Density similar to glass fibres
- Soft and smooth draping quality of woven fabrics
- Strong resistance to aging and fatigue
- Low coefficient of humidity absorption

A part of car-body floor pan thermosetting resins (epoxy matrix)

Middle-beam (B-pillar) Thermoplastic polymeric matrix

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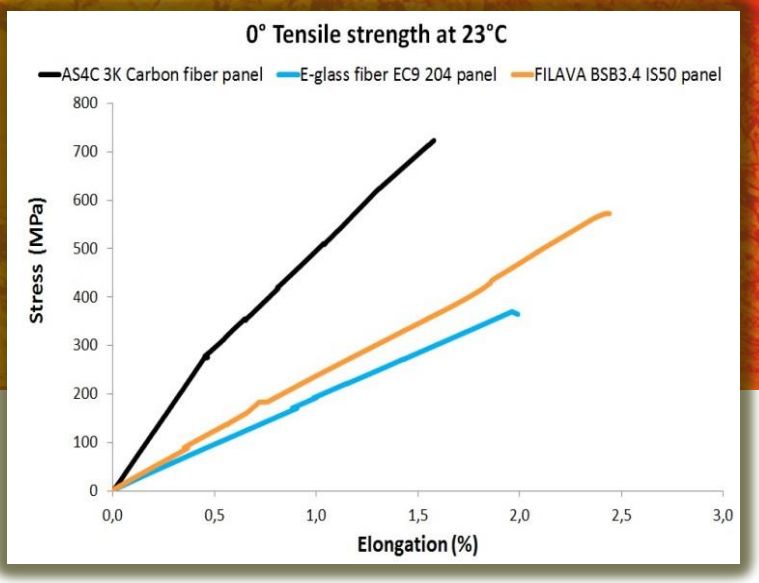
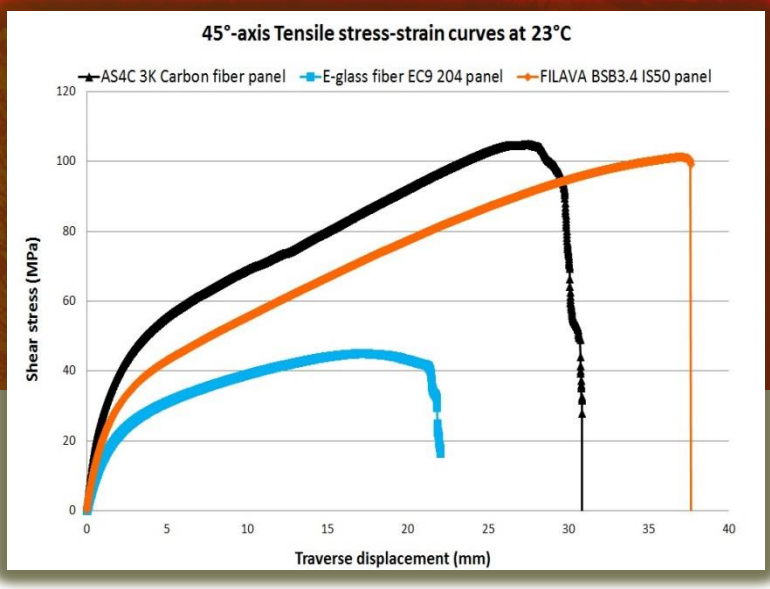
Results and conclusions from case study analyses (graphs):

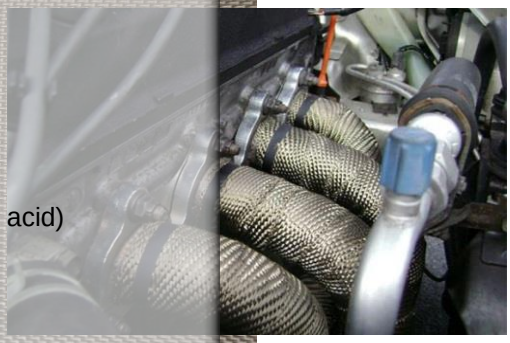




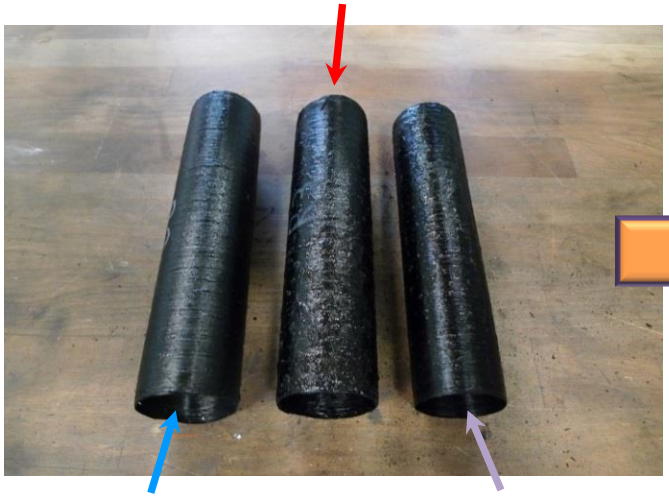
Thermal Applications : **Exhaust pipes, headers and various heat insulation components for engines**

Key benefits

- High coefficient of thermal insulation
- Strong resistance to aging and fatigue
- High elongation at break
- Low coefficient of linear thermal expansion
- Low coefficient of humidity absorption
- Excellent chemical behaviour in presence of corrosive agents (alkaline as well as acid)
- High insulation properties
- No galvanic or metal corrosion particularly in high-moisture environments
- Softening point close to 1.000 °C



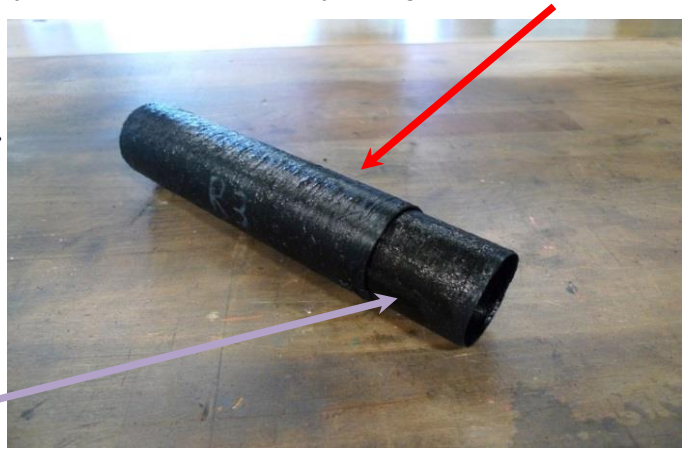
Tube made with **FILAVA**™ fibres



Tube made with carbon fibres

Tube made with ordinary basalt fibres

Neither shrinkage nor softening is observed for carbon fibres and **FILAVA**™ over 650°C contrary to the most common and basic basalt fibres (picture showing shrinkage of basalt tube after pyrolysis, with basalt tube easily sliding into the **FILAVA**™ tube)



FILAVA™ is a stable mineral product, completely neutral for the environment and 100% directly recyclable as per existing European regulations