

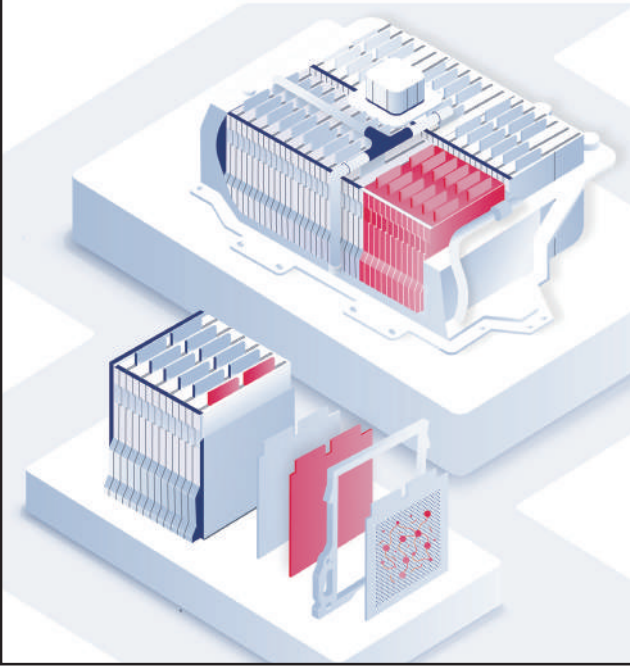
ARKEMA

INNOVATIVE MATERIALS
FOR **AUTOMOTIVE**



At Arkema, we are helping the automotive industries achieving these goals with **innovative, high-tech materials** that enable manufacturers to face the constant evolution of their markets.

Battery



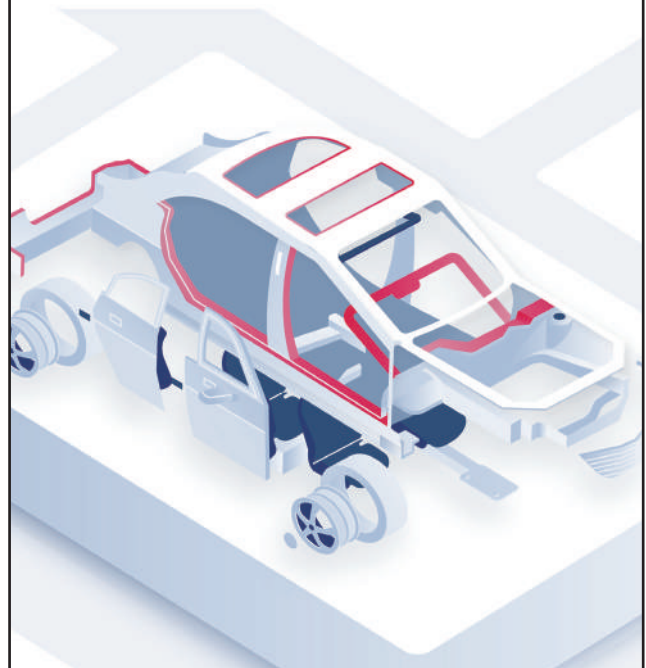
Body, Interior and Exterior



Fuel Cell Electric Vehicles



Powertrain and Chassis



ARKEMA

High performance materials for Automotive

High performance materials are at the heart of the automotive industries historical transitions.

We are known for our expertise in specialty materials and been witnessing and supporting the many major evolutions in the automotive market.

We are ready and able to provide high performance solutions for next generation vehicles which will be Light weighting, durable, with more sustainable carbon free mobility.

What we offer:

- A combination of material expertise and problem solving skills for the most challenging automotive applications
- Project assistance from our top level expert teams to our global network of technical centers
- An industry leading portfolio of specialty solutions for highly demanding applications in the automotive industry.



“Our development is focused on high-growth **technologies that are firmly rooted in sustainability.**”

---Thierry Le Hénaff
Group's Chairman/CEO

We have focused our R&D on five platforms to meet the challenges of sustainable development

Aligning the entire Arkema offering with the United Nations' Sustainable Development Goals (SDGs) is the objective of the ARCHIMEDES program



A PROGRESS INITIATIVE RECOGNIZED BY THE NON-FINANCIAL RATING AGENCIES



Member of
Dow Jones Sustainability Indices
Powered by the S&P Global CSA



“A” rating since 2017



In 2021, received a “B” rating for Climate Change and a “B” rating for Water Security



Listed on the Europe 120 and Eurozone 120 indexes since 2015



Arkema is among the top 1% of the industry's highest rated companies since 2014



“C+” rating, Arkema ranks in the top decile worldwide

Joined the DJSI World and DJSI Europe indexes in 2020

Joined the CAC 40 ESG in 2021

COOLING

Cooling Circuits - Rilsan® and Rilsamid®

- Reliable solutions which well regarded by the market
- Excellent mechanical strength, high flexibility and ease of processing
- Chemical resistance to cooling media as well as road salt damage
- Rilsan® PA11 is a bio-based material made from sustainable castor plants

BATTERY



Fluoro coolant - Forane®

Forane® provides Ultra low-viscosity, Dielectric, Non-toxic, Non-flammable solution for direct battery cooling

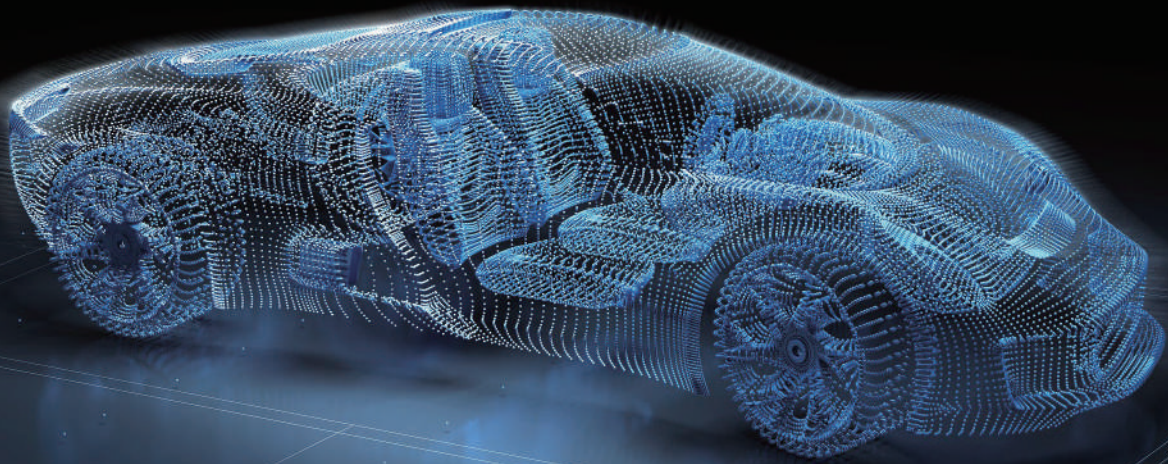
Immersion cooling – Oleris®

- Low viscosity at extreme low temperatures
- Improve battery efficiency attribute to significant reduction of charging time
- Oleris® n-heptanoic is a sustainable acid

Inter-cell cooling – Rilsan® Fine Powders

- Excellent adhesion on metal substrates
- High flexibility and durability
- Excellent insulation properties with low thickness (< 200 µm)
- Bio-based Rilsan® Fine Powders are made from sustainable castor plants





Bostik Smart Sealants

- Battery pack sealing and gasketing: SMP (Silyl Modified Polymers), Butyl, HMPSA (hot melt pressure sensitive adhesives), Synthetic rubber, CIPG/UVFG
- Structural bonding battery pack: MMA (methyl methacrylate), Instant adhesive (2K Cyanoacrylates), 2K-PU (polyurethane).

Busbar coating – Rilsan®

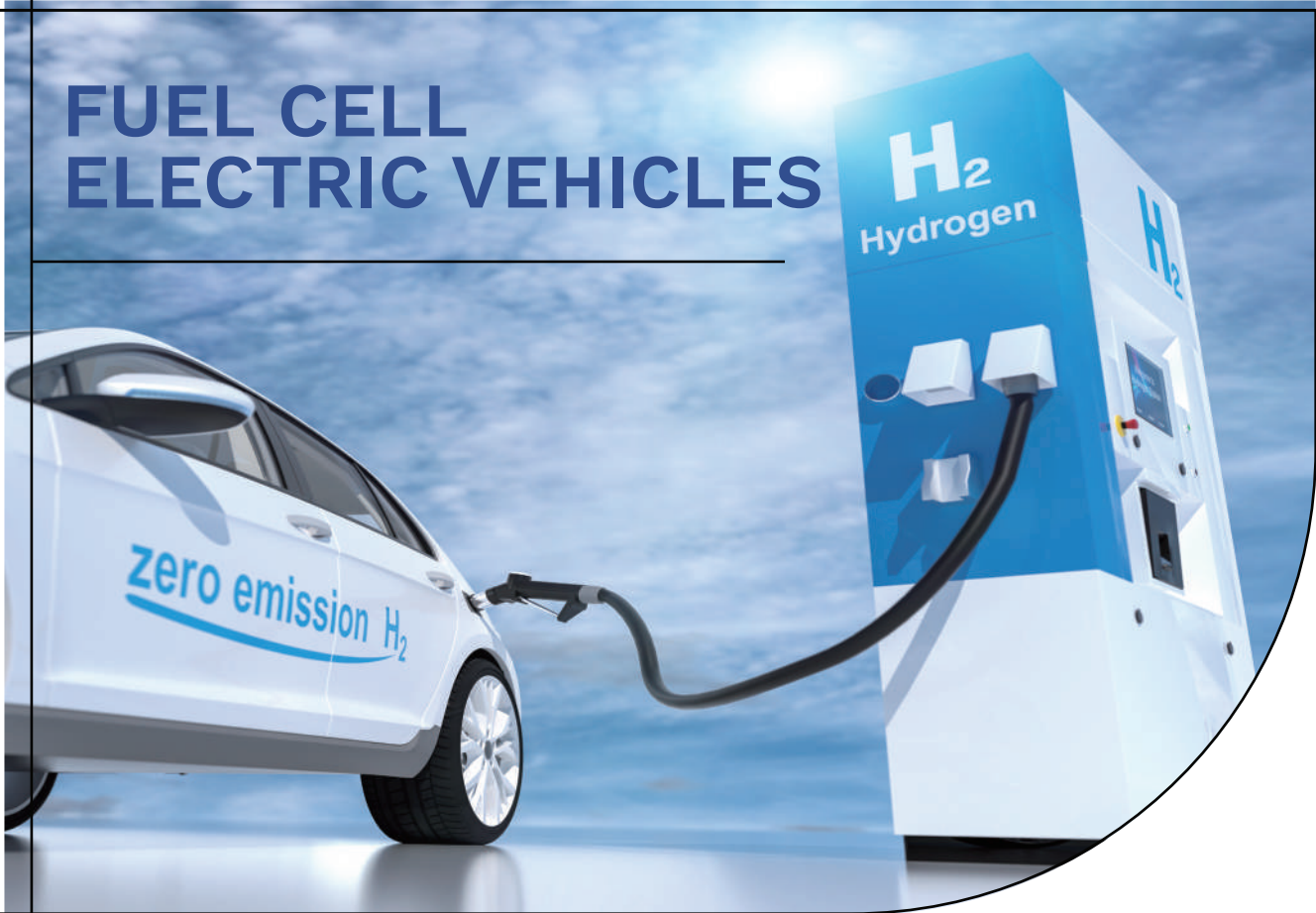
- Good electrical and mechanical properties
- Exceptional abrasion resistance as well as thermal and chemical resistance
- Excellence processing and bonding with copper or aluminum
- Available for extrusion and powder coating

Thermoplastic Composite Housing – Elium®

- Elium® is 30% to 50% lighter than identical parts made out of steel is with possibility to recycle via de-polymerization
- Elium® is the first thermoplastic resin designed for manufacturing composite parts with high performing mechanical properties



FUEL CELL ELECTRIC VEHICLES



Rilsan® PA11 for Hydrogen pipeline

- Excellent chemical resistance and mechanical properties
- Excellent barrier properties compared to other thermoplastics
- Associated with other materials in multi-layer structures, easy processing

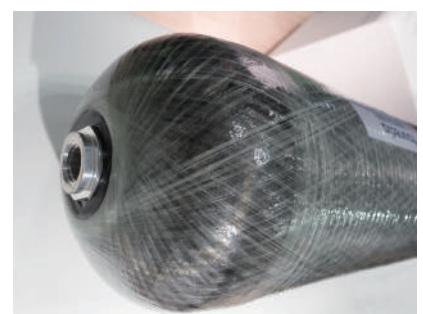
Rilsan® PA11 for Hydrogen Tank Liner

- Balance in lightweight and gas barrier
- Excellent intrinsic resistance of Rilsan® PA11 to low temperatures
- Easy of processing, whether rotomolding, extrusion blow molding, injection molding and welding or extrusion
- Proven to resist crack generation and blistering in case of compression and decompression



Elium® for Composite Tank Shield

- Liquid thermoplastic resin, lower cure temperature
- Superior toughness than conventional thermoset solution with excellent stiffness
- Easy recycling, whether physically or chemically



POWERTRAIN & CHASSIS

Rilsan® PA11, Rilsamid® PA12, for Fuel System

- Compatible with every fuel /temperature combination
- Low contamination (oligomers, extractible)
- Ease of processing and laser weldable
- Conductive solutions available



Rilsan® PA11 and Orgalloy® PA Alloy for Air Conditioning Circuits

- Compatible with various refrigerants (R134a, R1234yf, R744...)
- Extremely low permeation
- High adhesion and durability (VW performance)
- Full plastic solution available

Rilsan® PA11 and Rilsan® HT PPA for high temperature tubes (blow-by, TOC, SCR ...)

- High working temperature up to 160°C continuous
- Excellence hydrolysis and chemical resistance
- Up to 60% weight reduction and 50% cost reduction than metal&rubber solutions



ARKEMA

Forane® for Refrigerants (R134a, R1234yf ...)

- Non-ozone depleting solutions
- Sustainability

Apolhya® Rilsan® for Cable/Tube Jacket in Underhood

- The only soft polyolefin based thermoplastic material can withstand in 150 °C /3,000 hours or even higher
- Good hydrolysis, oil and chemical resistance
- Suitable to full spectrum of processing

Luperox® Rubbers and Elastomers Agent (Belts, Tubes, O-Rings, Gaskets)

- Low compression set at elevated temperature
- Resistance to various fluid, chemicals and Electrochemical degradation
- Low swell in fluids and greases
- High modulus and tear resistance

Vultac® and Heavy Mercaptans for Tires

- Vultac® is a nitrosamine-free vulcanizing agent
- Heavy Mercaptan is the most efficient chain transfer agent.

BODY / INTERIOR / EXTERIOR

2K PU&MMA adhesives for Exterior

- Typical applications are plastic tail gate, spoiler and foot rest bonding
- Less pretreatment
- High elasticity and durability

Elium® for Composite Structural parts

- Thermoplastic resin is recyclable
- Better impact and higher fatigue than thermoset
- Liquid process



Elastosol Structural adhesives for body-in-white

- Rubber based, suit for anti flutter, hem-flange weld through sealer and structural
- High efficiency
- Health and safety
- Durability



Water Base and Hot Melt adhesives for Interior

- Typical applications are Door Panel and Instrument Panel Lamination, Headliner, Carpet, weatherstrip bonding
- Health and safety
- Good adhesion performance
- Easy operation

Polysulfides for antioxidant and stabilizer of polymer in exterior and interior






- Moderate odor
- Colorless liquid



THE CASTOR BEAN TRULY SUSTAINABLE!

ARKEMA

Rilsan® Rilsan® HT Rilsan® Clear Rilsan® Fine Powders Pebax® Rnew® Oleris®

-  No competition with food / feed
-  No deforestation
-  Highly profitable for the farmers (the main reason they grow castor)
-  Grown mainly in India only in the poorest soil
-  The beans are crushed to make ~45% oil and 55% cake (sold as fertilizer)

FROM CASTOR BEANS TO SUSTAINABLE SPORT APPLICATIONS HIGH PERFORMANCE MATERIALS

CASTOR PLANT



CASTOR OIL



POLYMER



CASTOR SEEDS



AMINO 11

RENEWABLE FEEDSTOCK REDUCING DEPENDENCE ON FOSSIL FUELS



> 1 MILLION YEARS TO PRODUCE OIL

1 YEAR TO PRODUCE CASTOR BEANS <





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