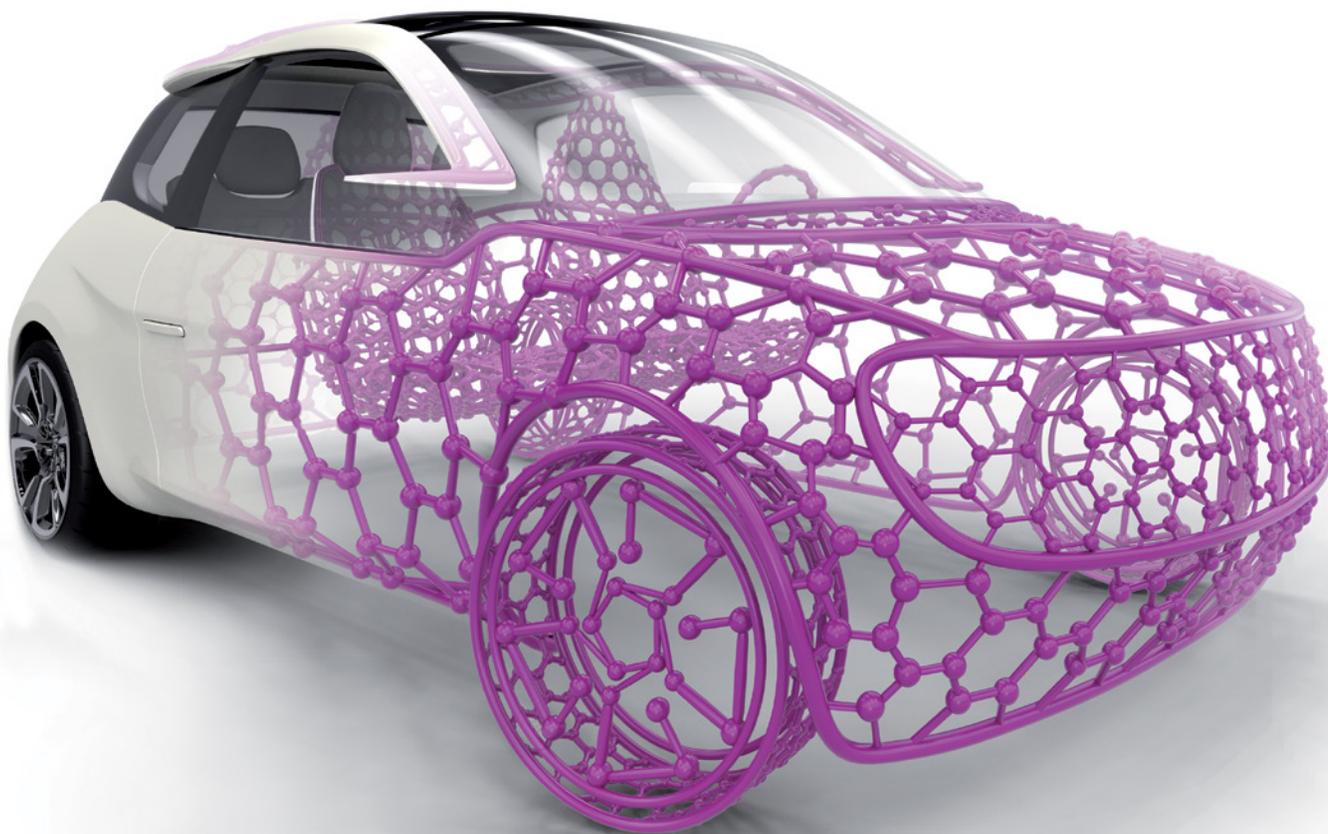


EVONIK FOR AUTOMOTIVE

**INNOVATE MOBILITY -
WE PROVIDE THE CHEMISTRY.**



MEETING THE CHALLENGES OF TODAY AND TOMORROW

Evonik is working on innovative materials and processes, providing solutions for better cost efficiency and more environmentally friendly systems as well as materials that are more resistant to chemical or mechanical stresses.

Our developments focus on four key drivers of innovation: We save weight, we boost efficiency, we create surfaces and we manage light.

The competencies that have fueled success for Evonik and its customers for decades are as varied as the many different applications in the automotive industry.



We save weight.

Evonik develops high-performance lightweight materials to replace metal or rubber parts. By combining different polymer materials weight is reduced and efficiency soars. Our solutions give customers the power to design commercially optimized vehicles with a perfect blend of multi-material systems.



We boost efficiency.

Evonik provides innovative technologies to reduce energy consumption and CO₂ emissions while boosting efficiency with advanced lubrication of engines and drive trains, low friction parts, and reduced rolling resistance of tires.



We create surfaces.

Evonik provides innovative raw materials to protect and valorize surfaces. Whether the target is a high gloss or a matte surface, enhanced scratch resistance, or decorative pillar cover or panel, we offer products that improve design and extend the lifespan of car components.



We manage light.

Evonik develops materials that enable advanced lighting technologies for the ultimate in performance and safety, as well as ensuring passenger comfort and classic design.

INNOVATIVE SOLUTIONS THROUGHOUT THE ENTIRE VEHICLE

Our strong competitive position is based on advanced technology expertise, an innovative spirit and close cooperation with our customers. By focusing on dynamic trends and developments, resource efficiency and sustainable transportation we stand behind OEMs in their quest to meet the key demands of the automotive industry.

Evonik provides a wide product portfolio for applications: from exterior panels made of composites and lightweight polymers, to coatings and adhesives used throughout the car, and for over parts under the hood or tubing systems, as well as interior applications like seats, trim parts and ambient lighting – we have solutions to benefit virtually any vehicle component.

Innovate mobility – we provide the chemistry.

Exterior and body applications



1 Hybrid structures metal/plastics

Prepregs based on VESTALITE P 342 provide material-efficient composite solutions by local reinforcement of structural metal parts. Due to high adhesion and controlled reactivity of the resin, bonding and curing can be achieved in a combined fast process step without need for adhesive films.

The reactive adhesive VESTAMELT® increases the bonding of plastic resins on metal inserts. Therefore it saves weight and space in overmolded hybrid structures e.g. in front end carriers or floor panels.

2 Structural parts

Placing reinforcing fibers where needed and overmold it to the final shape: this is the idea of VESTAPE®, unidirectional fiber reinforced tapes with a thermo-plastic matrix like PA or PEEK.

For autoclave, RTM or wet pressing, the high temperature and creep resistance of the rigid foam ROHACELL® is the trouble-shooter for high-end fiber reinforced plastics (FRP) sandwich structures like roofs, engine hoods or battery housings.

In-mold foamed with homogeneous particle distribution, ROHACELL® Triple F offers ready to use complex 3D shaped sandwich cores. With a couple of additives, the performance of resins for FRP can be optimized for the individual requirements of the processes.

DICYANEX® micronized dicyandiamide, combines easy handling with high performance and long formulation latency for 1K epoxy applications.

VESTAMIN® enhance the mechanical properties of the composite and offers a high surface quality.

The nano structured silica in the NANOPOX® product family improves the toughness and fatigue behavior e.g. for FRP springs. NANOPOX® is a transparent and low viscosity additive for in-mold coatings and helps to realize class-A surfaces.

The rubber particles in ALBIPOX® are homogenously distributed in epoxy composites to improve the toughness.

VESTALITE P 312 is a non-tacky polyurethane-based resin intended for easy and automated prepreg compression molding processes. Resulting composite parts exhibit high toughness, as well as excellent surface qualities and light stability, which allows for reduced effort in painting and afterwork processes.

3 Exterior Coating and Corrosion Protection

Clear coats based on VESTANAT® EP-M-family combine the flexibility and ease-of-use of a PU coating with a glass-like hardness. This results in unprecedented scratch- and chemical resistance.

AEROSIL® hydrophobic fumed silica is used as an additive in a variety of coatings to optimize rheology during processing, as reinforcement of silicone elastomers and leads to excellent water-repelling properties and improved corrosion protection.

The Dynasytan® family offers a large variety of silanes, used for high performance coatings, metal treatment and resin systems.

Usually known as adhesion promoters they act as a binding agent between organic resins and inorganic substrates.

To optimize the properties in various dimensions, the SURFYNOL®, ACEMATT®, AEROSIL®, and TEGO® additive lines offer solutions for adhesion promotion, corrosion resistance, foam control, pigment dispersion, substrate wetting or surface control.

As binder the unsaturated polyester resin DYNAPOL® for coil coating top coats assures high gloss and resistance against color fade out or dirt pick up.

4 Headlamps and rear light

ACRYLITE® molding compounds for automotive lighting applications provide highest levels of transparency, UV- and weather resistance. ACRYLITE® is used since decades for signal lights with extensive color stability tests performed in Florida and Arizona.

With extended heat resistance ACRYMID® is used for lenses in headlights to illuminate the street where it is needed.

5 High gloss exterior trim

ACRYLITE® Hi-Gloss provides out-of-tool lightweight exterior parts with class-A surfaces. There is no need for subsequent painting or coating steps.

6 Windows

Freedom in design combined with low weight and lifelong crystal clear appearance makes impact resistant ACRYLITE® ideal for glazing for roofs, rear and side windows.

The water repellent Dynasytan® SIVO CLEAR ensures a clear view, even during strong downpours.

7 Adhesives & Sealants

Outstanding low VOC and FOG values of PU Hot Melts can be achieved with DYNACOLL® polyesters. They are ideal for interior lamination and bonding of headlamps or windshields.

A low VOC content, high thermal stability and easy handling makes VESTOPLAST® the perfect raw material for hot melts used in interior bonding such as headliners, door panels, dashboards or for insulation felts and car carpets.

For superior adhesion properties on oily or degreased metals the POLYVEST® range contributes to a large variety of Body-in-White adhesives and sealants to be easily applied by robot or manually along car assembly.

High quality two-part PU adhesives for headlamps can be reached by the flexible and hydrophobic polymeric binder POLYVEST® HT.

Depending on the target substrates, the VISIOMER® product range offers the right monomers for acrylic based adhesives. Usually those kind of structural adhesives need no further surface preparation.

NOURYBOND® adhesion promoters are essential in automotive sealant, underbody and anti-chip primer formulations, providing unique rheological properties and improved adhesion to electro-deposition primers. Plasticizers like VESTINOL® are able to further enhance adhesion.

Under the hood and underbody applications



1 Powertrain

Under the hood, you find high temperatures, chemical aggressive fluids and gases, but the high performance polymers VESTAMID® HTplus PPA or VESTAKEEP® PEEK can stand it: As a silent running gear wheel, laser welded electronic housing or lubricant free swivel-joints.

2 Lubricants

Engine oils and transmission fluids formulated with DRIVON™ technology reduce fuel consumption and CO₂ emissions while ensuring wear protection and durability for critical powertrain components. The versatile Viscosity Index Improvers (VIIs) bring advanced fluid technology to formulation of high-performance shock absorber and power steering fluids. They provide excellent low temperature properties and provide optimal viscosity across a wide range of temperatures.

3 Plastic tubing systems

In fuel lines, cooling lines for EVs or for transmission oil, monolayer or multilayer tubing with VESTAMID® are significantly lighter than metal, but still guarantee high mechanical, thermal and chemical performance. They are low extractable to avoid blockages in modern fuel injection systems.

4 Chassis

Weight saving in the chassis, are a new field for composites, especially in the unsprung masses like rims or strut wheel mount modules. The BMI based resins COMPIMIDE® provide excellent mechanical properties, even at temperatures up to 250°C.

In-mold foamed structural PMI based ROHACELL® Triple F, with accurately placed metal inserts, makes it simple to create complex, ready-to-use 3D shaped cores that can be processed in RTM and wet pressing at elevated temperatures and pressures.

A very cost efficient method to produce FRP-profiles is the PulPress technology. This Evonik-developed continuous process technology combines pultrusion and press processes with a ROHACELL® foam core to create lightweight and complex 3D components.

Lightweight FRP driveshafts get a higher fatigue with NANOPOX® nano structured silica added into the epoxy resin.

5 Battery and electrics

AEROXIDE® can improve safety, life-time or capacity when used for separator, anode or cathode of LIB in EV's.

Electronic components like ignition systems are encapsulated in epoxy resin with the toughener ALBIDUR® to improve the thermomechanical performance and to meet the high demands of harsh environments.

Electronic connectors reach higher temperature resistance if the basic thermoplastic material is equipped with the crosslinking agent TAICROS®.

6 Tires

ULTRASIL® silica and silanes like Si 69® and Si 363® are making today's tires safe and environmentally friendly. So called Green Tires with Silica/Silane-technology have proven to have significantly lower rolling resistance, resulting in a reduction in fuel consumption up to 8 % and thus lower CO₂ emissions. Additionally, they also have better grip – particularly in wet conditions – which significantly shortens the breaking distance.

POLYVEST® and VESTENAMER® further boost those properties and help to ease the processing.

Interior



1 Surfaces

To warrant a high durability of the car, lavishly decorated panels, consoles, and operational controls have to retain their appearance over the life of the vehicle. Sweat, skin oil, and cosmetics or sunlight, temperature swings or even cleaning agents can cause damage. Surfaces made of microcrystalline thermoplastic TROGAMID® are built tough for these requirements. They stand up to sunlight, heat, shock, not to mention cosmetics and other chemicals.

The excellent transparency of ACRYLITE® allows all kinds of coloration or perfect second surface decoration in center stacks or decorative trims and door panels. With an extraordinary haptic it's ideal for tough pads and other control elements. For very high demands in scratch resistance the system solution CoverForm® is recommended.

Spray skins include coatings for the dashboard and other plastic parts. In addition to high resistance, such components need to look and feel good, properties that VESTANAT® IPDI can noticeably improve. Hybridur® polymer dispersions provide excellent wetting and adhesion to a variety of substrates including wood and plastic to provide highly aesthetic, durable coatings.

2 Interior lights

ACRYLITE® is the polymer with the highest possible transparency which makes it an ideal choice for a variety of lighting applications such as light guides for ambient or contour lighting. Including special beads, ACRYLITE® Satinice df illuminates homogeneously wide areas by hiding the light source itself.

3 Foam Parts

On average, passenger cars contain up to 30 kg of polyurethane foam, found in seats, headrests, armrests, carpet backings, sound deadening mats, steering wheels, roof linings and instrument panels. Evonik offers the broadest product portfolio of catalysts, surfactants, release agents and performance additives for all types of foamed and non-foamed polyurethane materials by combining market leading brands, including TEGOSTAB®, TEGOAMIN®, DABCO®, POLYCAT®, ORTEGOL® and GORAPUR®, to offer the most comprehensive package for product differentiation.

4 Structure

UD-tapes with a thermoplastic matrix called VESTAPE® can be over molded to reinforce thermoplastic structures e.g. in seats.

The bonding of injection molded resins on metal inserts e.g. in cross car beams can be significantly increased with the VESTAMELT® adhesive.

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