Borealis & Mobility

e-Powertrain & Under the Bonnet

Sustainable solutions with lightweight and robustness are provided for demanding applications

Keep Discovering

BOREALIS

Borouge

Contents

We help you excel in mobility

Reduce weight

Innovating for lightweight solutions

Borealis strives for sustainable mobility by innovating to reduce vehicle weight and enhance its energy efficiency. We collaborate with OEMs, TIERs, and value chain partners to deliver tangible benefits to the industry, drivers, passengers, and the environment. Our cutting-edge innovation comes with unparalleled quality control assurance.

Improve sustainability

Promoting circular economy solutions

Polyolefins provide a lower environmental footprint compared to many conventional materials. Recognizing that plastics are too valuable to waste, Borealis drives the transition to a circular economy for plastics with our advanced mechanical recycled Borcycle™ M, chemical recycled Borcycle™ C, and bio-sourced Bornewables™. They focus on recycling post-consumer waste, reducing CO_2 emissions, and decoupling from fossil-based feedstocks while maintaining high-performance standards.

Save costs

Delivering cost-efficient high-performance alternatives

The polypropylene (PP) compound solutions offered by Borealis and Borouge are cost-efficient and high-performance alternatives to conventional metal and engineering plastics. Our tailor-made materials are easy to process, even in complex geometries and surface textures. Enabling design freedom and highly functional parts across a wide range of process parameters. They create robust surfaces with excellent aesthetics, paintability, and high scratch resistance.

Access globally

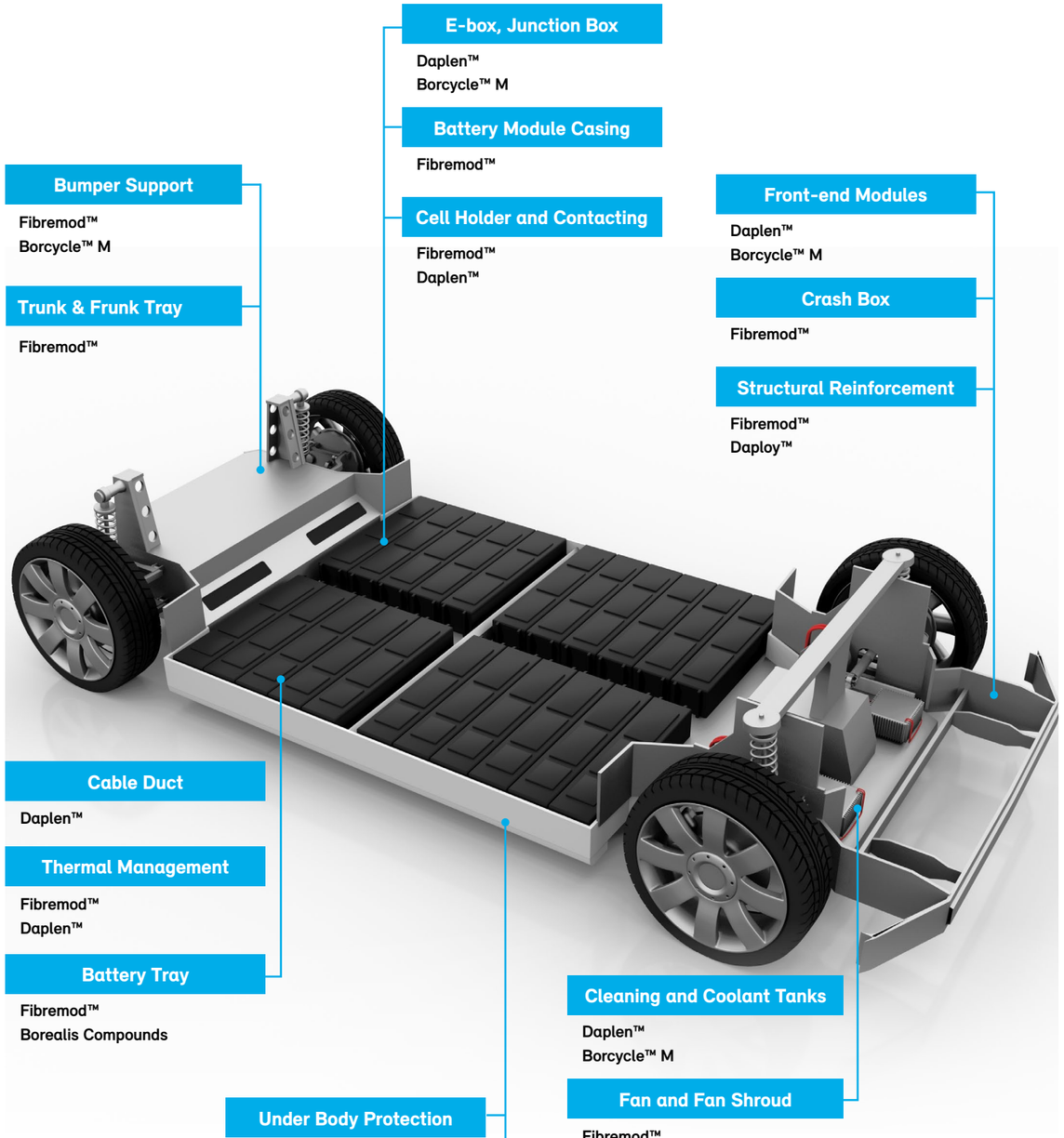
Growing global footprint and local presence

With operations in over 120 countries, the Borealis and Borouge footprint is truly global. Our presence on the ground enables us to provide dedicated support to automotive OEMs and Tiers all over the world. Highly skilled and experienced teams in our development centers and operations in Europe, the Americas, and Asia are re-inventing plastics for sustainable mobility.

Borealis e-Powertrain & Under the Bonnet solutions

Dedicated to sustainable mobility

Mobility is a core business segment at Borealis. We apply our specialist knowledge and decades of experience to develop innovative and sustainable polypropylene (PP) and thermoplastic polyolefin (TPO) solutions for a broad range of e-Powertrain (ePwt) & Under the Bonnet (UTB) applications, including battery trays, under body protection, crash box, and more.



Our comprehensive range of PP and TPO polymers and compounds have precisely balanced and tailored properties to match the specific needs of the automotive industry. As substitutes for more expensive metals and engineering plastics, they add value by helping manufacturers lower system costs while at the same time maintain the highest global performance standards. They enable faster development-to-production cycles. Crucially, these materials help reduce the amount of material and energy inputs required – a significant boost for sustainability.

The newest additions to the Daplen™, Fibremod™ and Borcycle™ grade portfolios boast the lowest densities in combination with excellent surface aesthetics and high purity. These key features help reduce the material mix in a broad range of ePwt & UTB applications and increase circularity in the industry.

Powered by innovation

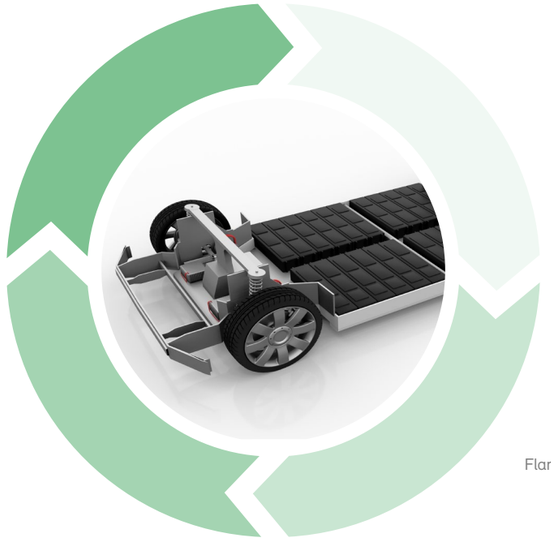
Lightweighting, electrification, connectivity, shared mobility and autonomous driving are the trends, converting tomorrows cars into an intelligent system rather than being an assembly of individual parts. UTB materials have a tough life. Parts located close to thermal engines must withstand high temperatures and are exposed to a variety of corrosive fluids. Other UTB components must cope with road salt, dirt and dust. Housings for heating, ventilation, and air conditioning (HVAC) systems are subject to constant shock and vibration at high operating temperatures in addition to being exposed to fuels and lubricants.

Electrification brings additional requirements and new parts to be considered

- Lightweight
- Improved yield
- Flame retardancy
- Sustainability

Physical Properties
High burst pressure
Impact strength
Creep and fatigue
Stiffness

Application Properties
Safety
Electrical insulation
Low density



Processability
Flowability
Cycle time
Shrinkage
Wide process window

Stabilization
Halogen Free-
Flame Retardancy (HFFR)
Heat resistance
Chemical resistance

– Modeling and simulation
– Reliable and reproducible test results
– Application development
– Technical support
– Custom tailored materials

Ultimately, reliability in each particular aspect is confirmed by the reality of day-to-day and long-term performance. For robust, safe and high performing ePwt applications our PP and TPO compounds provide the strength and required stabilization to even replace incumbent metals and engineering plastics.

Innovation Headquarters in, Linz, Austria.

At Borealis and Borouge, we are dedicated to developing material solutions, which meet both existing and future needs of the industries we serve. This process is guided by creative innovation working with partners to identify needs before they become challenges and developing solutions that add value along the supply and production chain.

To support these goals Borealis operates three world-class Innovation Centers. Our innovation teams are engaged in the development of new materials or material improvements, as well as customer technical services ranging from part design and prototype simulation to the production and testing of batch samples and assistance with the initiation of series production. They are also tasked with the ongoing improvement of Borealis' own methodologies and processes.

Examples of mobility related application testing

Paint Robot

Tiger Stripe

Emission, fogging & odor

Shrinkage Tool

Material & Application Testing

Analytical and Physical Testing

Advanced Polymer Characterization

Modeling and Simulation

Plastics Conversion Technologies

Reduce weight

Our Fibremod™ high performance glass fiber reinforced PP compounds are supporting the automotive value chain in achieving its weight-saving and process cost-saving targets. Our customized glass fiber reinforced PP solutions are at the cutting-edge of innovation, bringing lightweight, extra strength and impact performance to a wide range of applications, including front-end carriers, air intake manifolds, fans and fan shrouds, battery trays and more. They also support more environmentally-considerate production by reducing processing temperatures and energy requirements when replacing alternative solutions such as PA.

Fiber reinforced polypropylene compounds have complex structures and require sophisticated capabilities to engineer successful solutions. Borealis has therefore developed computerized methods to predict fiber orientation and distribution enabling integrated simulations of the final application's performance. Borealis has also established state-of-the-art testing methods and standards for fiber reinforced polypropylene and is committed to enhancing modelling and simulation methodologies. This capability supports Borealis' customers and helps them to develop and implement new lightweight solutions based on Fibremod at low cost, by minimizing expensive testing and prototyping.

As conventional ePwt & UTB materials such as steel and aluminium are gradually being replaced by high-performing plastics, Borealis has led the way, developing a wide portfolio of PP solutions, ranging from short (SGF) to long glass fiber (LGF) compounds for reinforced ePwt & UTB applications.

Borealis is in fact the first company to have developed and commercialized a PP material for air intake manifolds, making it the first to have enabled the switch from polyamide (PA) to PP for this component.

Fibremod™ GB307HP

Fibremod™ GB307HP is a 30% glass fiber-reinforced PP compound intended for use in injection molding of nonvisible structural parts like air intake manifold.

- Lightweight material suitable for engineering plastic replacement
- Cost efficient alternative to PA
- Copper stabilized
- High thermal resistance and HDT performance
- Burst pressure resistance

Check the Fibremod™ brochure for more information about Fibremod technology.

Save costs

As a key innovative supplier, Borealis has developed a full range of safe, affordable, flexible and environmentally friendly Halgon Free Flame Retardant (HFFR) polyolefin solutions to support production of Li-Ion Battery (LIB) housings and structural parts.

Safe

HFFR polypropylene solutions for LIBs enable you to establish:
- Excellent electrical performance with CTI 600V
- Flame retardant – V0 down to 1.6mm (UL94)
- Balance stiffness, elongation and flowability

Affordable

HFFR polypropylene for LIBs enables you to:
- Save up to 29% on value due to lower material density (*)
- Achieve over 50°C lower processing temperature that leads to shorter cycle time and energy consumption
- Achieve good processability with low complexity

Flexible Design

HFFR polypropylene for LIBs enables you to be flexible:
- A variety of different HFFR PP grades to choose from
- Applicable for battery housings, cell holders, top covers, charging sockets, etc.
- LIB-experienced modelling & simulation experts with proprietary material cards

Environmentally-Friendly

HFFR polypropylene for LIBs enables you to:
- Achieve 50-75% lower CO_2 emissions (*)
- Save up to €260 per tonne on potential carbon tax (**)
- Contribute to a circular economy and become part of a PP recycling stream

(*) vs. other used plastics such as PA or PC/ABS. Source: Plasticseurope
(**) Example: Based on planned CO_2 price of 55€/t by 2025 in Germany. Based on CO_2 footrint of virgin PP vs. virgin PA (6,6)

Visit Electrification & Borealis for more information about our battery solutions.

Improve sustainability

Whether for Interior, Exterior, e-Powertrain & Under the Bonnet: Borealis and Borouge offer a range of more sustainable mineral-filled and glass fiber reinforced solutions. These enable the use of higher amounts of recyclate in the respective part; produce more easily recyclable applications; and enable the substitution of circular materials for conventional polyolefins, thereby enhancing the environmental footprint of the final product.

Borcycle™ GD3600SY

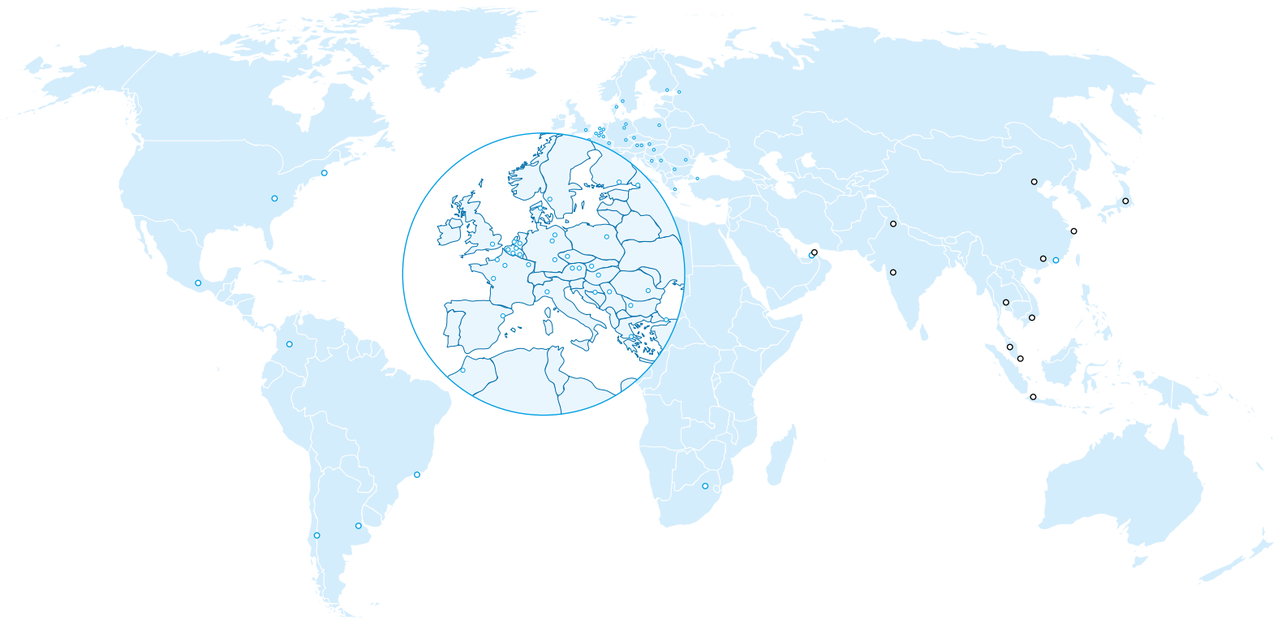
Borcycle™ GD3600SY is a 30% glass fiber-reinforced PP compound containing 68% post consumer recyclates, intended for use in injection molding of non-visible parts like brackets, headlamp housing or center console carriers. Borcycle™ GD3600SY has an excellent stiffness/impact balance while maximizing the use of PCR.

- 68% PCR content by weight
- Increases the use of recycled material in the vehicle
- Near-virgin performance properties
- Easy processing

Access globally

In re-inventing essentials for sustainable living, we are building on our commitment to safety, our people, innovation and technology, and performance excellence. We are accelerating the transformation to a circular economy of polyolefins and expanding our geographical footprint to better serve our customers around the globe.

With operations and development centers in the Americas, Europe, Middle East and Asia, we are close to where you are. Offering both, global solutions with aligned performance across regions, and solutions that are tailor made to the specifics of local markets.



Borealis Locations

Head Office Borealis AG
Austria

Customer Service Centers
Austria, Belgium, Brazil, Finland, France, Hungary, Turkey,
United States

Production Plants
Austria, Belgium, Brazil, Finland, France, Germany, Italy, Sweden, The Netherlands, United States

Innovation Centers
Austria, Finland, Sweden

Sales Offices/Representative Office
Argentina, Chile, China, Colombia, Czech Republic, Denmark, France, Hong Kong, Mexico, Morocco, Poland, Russia, South Africa, Spain, Turkey, UAE, UK

Borealis L.A.T Locations
Austria, Bulgaria, Croatia,
Czech Republic, France, Greece, Hungary, Romania, Serbia, Slovakia

Borealis Rosier Locations
Belgium, The Netherlands

Borouge Locations

Head Offices
Singapore, UAE

Innovation/Application Centers
China, UAE

Production Plants
China, UAE

Sales Offices/Representative Offices
China, India, Indonesia, Japan, Singapore, Thailand, UAE, Vietnam

Logistics Hubs
China, Malaysia, Singapore, UAE

The purpose of the pictures on this page are of representational nature only.

Circular Economy Solutions for Mobility

Join the circular revolution!

We can work together to make mobility more circular. Our ever-expanding range of circular material solutions can help you meet your own sustainability targets – without having to compromise on quality or performance.

Choose material solutions based on circular or renewable feedstock instead of fossil fuel-based feedstock.
As reliable partners, Borealis and Borouge are putting their expertise to work to ensure the secure and ample supply of high-quality circular materials on the market. We are committed to increasing the volume of circular materials and solutions we offer to 600 kilotons (kt) in Europe by 2025, and to 1.8 million kt globally by 2030.

Maintain premium part performance.
Our circular solutions offer high purity standards and are compliant with industry standards with regard to odor, emissions, and fogging. They also consistently deliver when it comes to aesthetics, including paintability, light and dark color matching, Class-A surfaces, and more.

Use less virgin material but still maintain lighter weight.
Lightweight and low-density materials used in a broad spectrum of mobility applications can be made even more sustainable by replacing virgin materials with grades from our Borcycle™ or Bornewables™ portfolios. Our circular solutions can substitute for virgin materials – both polyolefins and non-polyolefins – in any number of high-end automotive parts. In many instances, the foaming process can be used to reduce weight even further.

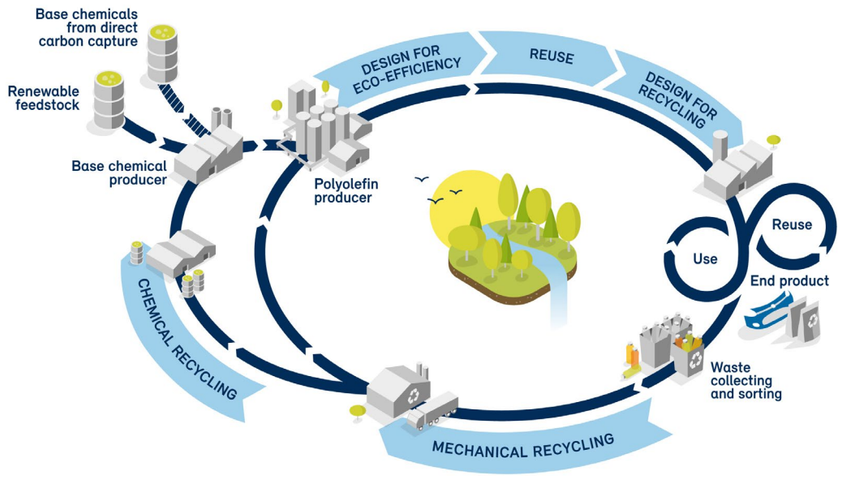
Increase the amount of recycled content in automotive applications.
The transformative Borcycle technology is advancing thanks to our innovation expertise in combination with value chain collaboration. By working together, we are unlocking the potential of recycled material by increasing the percentage of post-consumer recyclate (PCR) content by weight in applications while maintaining stringent performance requirements such as impact/stiffness balance as well as paintability and surface aesthetics.

Facilitate easier recyclability of automotive applications.
Part of our vision for a circular economy of plastics entails the development of PP monomaterials which are more easily recycled, and produce higher quality recyclate. Our innovation efforts are focused on design for recyclability and efficiency. Advanced testing facilities at our Innovation Headquarters in Linz, Austria, offer state-of-the-art modeling and simulation, and can assist you in testing the limits of circular materials.

The Borealis circular cascade model

Polyolefin plastic materials are versatile resources that should be reclaimed and reused. Because plastics are too valuable to ever be wasted, Borealis is committed to driving the transformation to a circular economy of plastics.

The **Borealis circular cascade model** depicts the diverse ways in which plastics can be kept in the loop: from renewable feedstocks to design for eco-efficiency; from design for recycling, to mechanical and chemical recycling – and then back to renewable feedstocks to close the circle. We use our polyolefins expertise to develop and implement innovative circular economy solutions with added value for our customers in all industry sectors, including mobility.



Borcycle™ - Our technology for recycling polyolefin waste into new plastics

Borcycle™ is one example of how we are accelerating towards circularity. This evolving technology uses recycling processes to transform polyolefins-based, post-consumer waste streams into new and value-adding solutions for demanding applications. **Borcycle™ M** grades are designed to fulfil the most stringent requirements, from stiffness/impact balance to processability, from paintability to good surface aesthetics. In short: our Borcycle™ M portfolio of mechanically recycled grades offers high material quality, but with a lower carbon footprint.

The virgin-level grades found in the **Borcycle™ C** family of chemically recycled solutions are fit for the most demanding applications, including food-contact and healthcare. Borcycle C grades are drop-in solutions and ISCC Plus certified. This means that the origins of these circular materials can be tracked and traced along the entire supply chain.

The Bornewables™ - Premium polyolefin products manufactured with renewable feedstocks

The **Bornewables™** portfolio of circular polyolefin products is another way in which Borealis is providing its customers and partners ever more sustainable alternatives to fossil fuel-based polyolefins. Bornewables grades are made of renewable-based feedstock derived entirely from waste and residue streams such as used cooking and vegetable oil (and thus not in competition with the food chain). The ISCC PLUS accreditation of the Bornewables grades is based on the mass balance method that allows the customer to track and quantify the effective renewable content at each manufacturing step. By using Bornewables grades, our customers can replace fossil fuel-based feedstock with an identical volume of sustainably sourced, renewable feedstock – without extra switching costs, and while maintaining the same high application quality.

Materials for ePwt & UTB solutions

Grade	Density [kg/m³] ISO 1183	MFR 230 °C/2.16 kg [g/10 min] ISO 1133	Flexural modulus [MPa] ISO 178	Tensile strength (50 mm/min) ISO 527-2	Impact, charpy notched 23 °C [kJ/m²] ISO 179/1eA	Impact, charpy notched –20 °C [kJ/m²] ISO 179/1eA	HDT B (0.45 MPa) [°C]	Typical applications
Dilution polymers for long glass fiber reinforced polypropylene								
BJ380MO	905	80	1200	25	5	3.5	90	Under body shielding
Borcycle™ UJ0583SY	920	80	1400	28	3.5	1.5		Under body shieldings, battery supports, front end modules
Halogen Free Flame Retardant PP compounds								
Fibremod™ FE121SF	1118	14	-	51	7			Lithium-Ion battery module housing, cell holder or insulation plate.
Fibremod™ FD221SF	1238	5	-	68	10	-	-	Lithium-Ion battery module housing, cell holder or insulation plate.
Fibremod™ FF311SF	1243	16	7790	86	9	-	149	Lithium-Ion battery module housing, cell holder or insulation plate.
Fibremod™ FE411SF	1426	3	-	106	6	-	152	Lithium-Ion battery module housing.
FJ081HP	1026	88	1980	20	1.4	1.1	107	Top cover of the Lithium-ion battery pack and similar solutions
Long glass fiber reinforced polypropylene								
Fibremod™ GB402HP	1240	-	8400	140	28	32	166	Frontend modulus, tailgate carriers, structural carriers
Polypropylene copolymer								
BE079UB	900	11	950	20	50	9	84	Under body shielding
BC545MO	908	3.5	1200	25	15	6	90	Battery case
BD310MO	905	8	-	28	9	4.5	92	Battery case
BC245MO	905	3.5	1250	25	15	6.5	85	Battery case, cable channels

Grade	Density [kg/m³] ISO 1183	MFR 230 °C/2.16 kg [g/10 min] ISO 1133	Flexural modulus [MPa] ISO 178	Tensile strength (50 mm/min) ISO 527-2	Impact, charpy notched 23 °C [kJ/m²] ISO 179/1eA	Impact, charpy notched –20 °C [kJ/m²] ISO 179/1eA	HDT B (0.45 MPa) [°C]	Typical applications
Polypropylene copolymer mineral filled								
Borcycle™ ME1490SY	970	12	1500	21	6	2	100	wheel arch liner, under body shielding
Borcycle™ MD2550SY	1080	5	2300	29	3.3	1.3		Brackets and reinforcement parts non visible
Borcycle™ MG2401SY	1090	23	2600	28	2.3	-	-	Baffle, under the bonnet applications
Polypropylene homopolymer mineral filled								
MD231U	1050	6	3300	36	3	1.2	125	Interior parts, climate control parts
MD441U	1220	6	4700	32	2.4	1.2	130	Air conditioning parts, under the bonnet components
Short glass fiber reinforced polypropylene								
Borcycle™ WE1255SY	980	12	3000	-	3.5	-	146	Airducts, HVAC housing
Fibremod™ GB307HP	1180	2.5	8000	115	11	10	160	Air intake manifold, fans and shrouds, parts of cooling systems
Fibremod™ GB311U	1120	2	6200	100	11	9	159	Air filter housings, head lamp housings, technical components
Fibremod™ WD300UB	1130	5	4700	60	8	6.4	160	Air filter housing, structural interior parts
Fibremod™ WE380HP	1130	10	4400	60	11	9	155	Dashboard, engine covers, structural carriers
Borcycle GD3600SY	1140	6.5	5600	75	8.5	-		Bumper brackets, head lamp housing, centre console carrier
Fibremod™ GD302HP	1140	4	5100	65	25	15	150	Rear seat structures, structrual components
Fibremod™ GD301FE	1140	4	6500	105	12	10	158	Pedal carriers, front-end carriers, lower bumper stiffeners
Fibremod™ GD301HP	1160	5	7400	105	9.5	9	160	Door module carrier, fans and shrouds, pedal carrier
Fibremod™ GB477HP	1230	2.5	9000	127	12	11	163	Front-end carriers, gear housings, pedal carriers, tank hinges
Fibremod™ GD577SF	1350	3	11300	160	11	-	-	Front-end carriers, pedals, cross beam, structural parts

Borealis at a glance

Borealis is one of the world's leading providers of advanced and sustainable polyolefin solutions and a European front-runner in polyolefins recycling. In Europe, we are a market leader in base chemicals and fertilizers. We leverage our polymers expertise and decades of experience to offer value adding, innovative and circular material solutions for key industries such as consumer products, energy, healthcare, infrastructure, and mobility.

Worldwide
Operating on five continents in 120 countries, with head office in Vienna, Austria

Key Financial Figures
In 2022, total sales of EUR 12,342 million and a net profit of EUR 1,396 million

Market Position
Ranked 2nd among polyolefin producers in Europe and 8th worldwide

Mechanical Recyling
Three polyolefin recycling locations in Europe

Employees
Around 6900 employees (full-time equivalents)

R&D
Record-breaking 133 priority patents filed in Austria in 2021

Ownership Structure
OMV holds 75% and Mubadala, through its holding company, 25%

Join Ventures
Borouge (with ADNOC, the Abu Dhabi National Oil Company, in Abu Dhabi, UAE) and Bayport Polymers (with TotalEnergies in Texas, US)

Business Areas
Production and distribution of polyolefins, base chemicals, and fertilizers

In re-inventing essentials for sustainable living, we are building on our commitment to safety, our people, innovation and technology, and performance excellence. We are accelerating the transformation to a circular economy of polyolefins and expanding our geographical footprint to better serve our customers around the globe.

In affirming our aim to be a global leader in advanced and sustainable chemicals and material solutions, the Borealis Strategy 2030 puts sustainability at the core of all our current and future operations. We have set ambitious sustainability targets for our Polyolefins and Hydrocarbons businesses with regard to greenhouse gas emissions, energy use, flaring, and circular economy products and solutions. Borealis is exploring the use of carbon capture technologies for base chemicals production in Europe, and has also formed a partnership, C2PAT, with Lafarge, OMB and VERBUND to plan and construct a full-scale plant in Austria for carbon capture and processing.

As a responsible petrochemicals company, Borouge believes that achieving a zero-waste circular economy of plastics calls for strong and concerted action on the part of the industry, governments, consumers, and society. For more information on how Borouge is accelerating the transition to the circular economy, go to: Borouge Sustainability Circular Economy.

Borealis AG
Trabrennstraße 6-8, A-1020 Vienna, Austria
Tel +43 1 22 400 000, Fax +43 1 22 400 333
borealisgroup.com

About Borealis Borealis is one of the world's leading providers of advanced and sustainable polyolefin solutions. In Europe, Borealis is also an innovative leader in polyolefins recycling and a major producer of base chemicals. We leverage our polymer expertise and decades of experience to offer value-adding, innovative and circular material solutions for key industries such as consumer products, energy, healthcare, infrastructure and mobility.

With operations in over 120 countries and head offices in Vienna, Austria, Borealis employs around 6,000 people. In 2022, we generated a net profit of EUR 2.1 billion. OMV, the Austria-based international oil and gas company, owns 75% of our shares. The Abu Dhabi National Oil Company (ADNOC), based in the United Arab Emirates (UAE), owns the remaining 25%.

In re-inventing essentials for sustainable living, we build on our commitment to safety, our people, innovation and technology, and performance excellence. We are accelerating the transformation to a circular economy of polyolefins and expanding our geographical footprint to better serve our customers around the globe. Our operations are augmented by two important joint ventures: Borouge (with ADNOC, headquartered in the UAE); and Baystar™ (with TotalEnergies, based in the US).

www.borealisgroup.com | www.borealiseverminds.com

Keep Discovering

BOREALIS