

Borealis and Borouge are Driving Tomorrow at the K 2019 with global collaboration and innovation

- **New premium NIO ES8 takes centre stage at K Fair 2019**
- **Second generation Fibremod Carbon grades expand range of low-density material solutions for the automotive industry**

Borealis and Borouge, leading providers of innovative, value-creating plastics solutions, will showcase a recent successful global collaboration with automotive industry partners at the K 2019. The NIO ES8, flagship model of the successful Chinese electric vehicle (EV) maker NIO, will be on display at the joint Borealis, Borouge and NOVA Chemicals stand. This premium sports utility vehicle (SUV) is a prime example of how Borealis and Borouge are supporting the industry on a global scale by engineering lighter weight, high-performance solutions for a growing range of automotive parts while at the same time allowing for more design freedom and customization.

Another automotive highlight in the spotlight at K 2019 is the launch of the next generation of Fibremod™ Carbon solutions based on second-use carbon fibre. Two new low-density material solutions, Fibremod™ CG210SY and Fibremod™ CD211SY, offer even better surface aesthetics and mechanical properties.

The NIO ES8: the sleek, upbeat face of EV automotive innovation

According to IHS Markit Automotive, in 2018, total sales in the major global markets for new electric vehicles – including all-electric, range-extended (REX), and plug-in hybrid (PHEV) vehicles – topped 2.5 million. Should the global trend of increased emphasis on EVs continue as predicted, EV manufacturers stand to sell around 4 million EVs in 2019. In major markets, all-electric, REX and PHEV sales will make up over 10% of combined passenger car and light commercial sales in 2020, with robust growth in China and the 28 EU countries driving these numbers. While EV sales are set to double in both EU-28 and China by 2020, market momentum in North American markets is not as pronounced.

A surge of new vehicles from major original equipment manufacturers (OEMs) in the next several years will increase competition among automotive marques. It will also offer more choice – particularly when it comes to value for money – to consumers thanks to a wider range of cost-effective EVs.

Incentives and infrastructure improvements will offer an added boost to EV market players in their quest to reduce tailpipe CO2 emissions across the globe.

Driven by stringent emissions regulations, industry policies, and by formerly generous subsidies, the Chinese market has experienced significant growth in recent years. While the market is currently facing some headwinds, it remains a leader in vehicle fleet electrification driven by domestic EV makers. Many new EV brands have appeared in recent years in China and NIO has distinguished itself based on design, technology and performance.

The leading premium Chinese EV manufacturer is known for its stylish and cheerful model design, and in particular the signature “Spark Beat” tail lights and “X-bar” which grace each NIO model. The all-electric, premium SUV NIO ES8 seats seven and has been in production since June of 2018. This model boasts an on-board proprietary pilot system, an advanced autonomous driving assistant system, and the first in-car artificial intelligence system in its class. Its swappable battery is a potential game-changer in the segment.

In developing the NIO ES8, the automaker’s list of requirements included high structural performance for parts, quality and consistency of materials, maximum vehicle range, and light-weighting solutions to mitigate the high battery weight. Borealis and Borouge worked in partnership with NIO and its Tier One suppliers to determine the right solutions for a variety of interior and exterior parts. Extensive modelling and simulation was carried out by Borealis and Borouge experts in both Europe and China. Using innovative grades supplied from the Borealis and Borouge global network, NIO has been able to achieve top parts performance and reduced component weight – but has also been able to realize its unique design vision for the model.

Lighter-weight NIO parts thanks to innovative Fibremod™ Carbon and Daplen™ grades

A highlight among the numerous interior and exterior NIO ES8 parts made using Borealis and Borouge grades is the **centre console structure**, a novel and useful design feature which – as befits the aspirational driver or passenger – is ideal for the stowing of luxury handbags. By forming the centre console bracket using **Fibremod™ CB201SY**, one of the ultra-lightweight grades in the Fibremod™ family of carbon-fibre filled polypropylene (PP) compounds, Borealis and Borouge were able to enhance customer value: a 20% reduction in part weight (when compared to use of conventional PP long glass fibre 40); good dimensional stability for a larger part of these dimensions; high stiffness; and suitability for injection moulding.

Innovative thermoplastic polyolefin (TPO) compounds in the **Daplen™** portfolio were used to make other low density parts, including front and rear bumpers; door panel and map pocket; and the Advanced Driver Assistance System (ADAS) brackets.

NIO ES8 Component	Benefits	Grade(s)
Centre console bracket	Lightweight, high stiffness, excellent dimensional stability	Fibremod™ CB201SY
Front and rear bumpers	Pleasing aesthetics of painted surfaces, good mechanical performance	Daplen™ EF119AEC
Door panel and map pocket	A-class surface, easy injection moulding process	Daplen™ EE189HPC Daplen™ EE250AIC
Cowl vent grill	Good dimensional stability, easy injection moulding process	MSC64T20C
Advanced Driver Assistance System (ADAS) brackets	Good balance of mechanical properties, dimensional stability	Daplen™ EF341AEC

“The NIO ES8 project is a textbook case on what can be achieved through collaboration and innovation on a global scale,” says Nicholas Kolesch, Borealis Head of Marketing Automotive. “Using innovative material solutions like Fibremod Carbon to help lighten the load of EV vehicles in particular is an essential aspect of CO₂ reduction. We will continue to advance our portfolio to offer an expanded range of options for weight savings potential, performance, and surface aesthetics.”



Photo: The NIO ES8: the sleek, upbeat face of EV automotive innovation, on display at the Borealis, Borouge and NOVA Chemicals stand at K 2019
Photo: © NIO

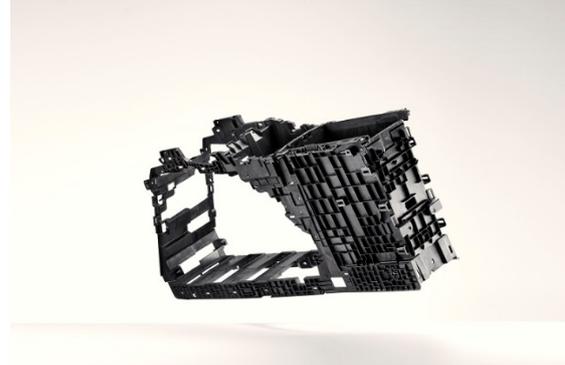


Photo: A highlight among the NIO ES8 parts made using Borealis and Borouge grades is the centre console structure: a 20% reduction in part weight was achieved by using Fibremod™ CB201SY, one of the ultra-lightweight grades in the Fibremod™ family of carbon-fibre filled polypropylene (PP) compounds.
Photo: © Borealis

“Guaranteed global supply, and reliable technical support on the ground, on site – this is the key to making international co-operation like ours on the NIO ES8 a success,” claims Ivan Xu, Borouge Vice President Marketing Center Mobility. “We look forward to ‘Building Tomorrow Together’ with our Chinese partners, and meeting head on the many challenges facing the industry, be it environmental legislation, vehicular safety, or increasing customization for the end consumer.”

And now, Fibremod Carbon PP 2G: the next generation

Collaboration with NIO and Tier One suppliers was instrumental in the evolution of the pioneering Fibremod™ Carbon product family. Originally launched in 2016, the Fibremod Carbon portfolio offers OEMs and Tiers a broad spectrum of opportunities for significant part weight reduction, but also for functionalization and modularization of components. Crucially, as a second-use carbon fibre material solution, Fibremod Carbon helps lower the overall CO₂ footprint of vehicles by enabling producers to use material resources more wisely and economically on the one hand, and by increasing the range of EV vehicles on the other thanks to lighter weight.

Responding to current demand for more sustainable solutions with enhanced surface aesthetics and mechanical properties, Borealis has now developed two new low-density additions to the portfolio: **Fibremod™ CG210SY**, containing 20% carbon fibre; and **Fibremod™ CD211SY**, a hybrid concept made with 10% talc and 10% carbon fibre.

Advantages include:

- Improved surface appearance and better dimensional stability
- Unsurpassed stiffness and durability
- Good paint adhesion and high flowability
- Made in Europe, available around the world

The grades are intended for use in structural parts and body panel applications, including fenders and tailgate skins, structural interior applications with complex geometry, and for class-A painted surfaces. Additional grades with enhanced surfaces aesthetics are currently under development for use in painted and unpainted parts.

Table of mechanical performance, Fibremod™ CG210SY and Fibremod™ CD211SY

	Fibremod CG210SY PPCF 20	Fibremod CD211SY PPCF10T10	Unit	Method
Density	1000	1020	Kg/m ³	ISO 1183
MFR 230°C/2.16kg	25	10	g/10`	ISO 1183
Tensile modulus	9700	5000	MPa	ISO 527-2
Tensile strength	85	40	MPa	ISO 527-2
Tensile strain at break	2	5	%	ISO 527-2
Charpy V-notched + 23°C / -20°C	6/5	6/4	kJ/m ²	ISO 179
Charpy unnotched + 23°C	40	30	kJ/m ²	ISO 179
	Surface optimized	Surface optimized and improved warpage behaviour		

K 2019 will take place from 16 to 23 October 2019 in Düsseldorf, Germany.

Be a part of “Building Tomorrow Together” by visiting Borealis, Borouge and NOVA Chemicals in Hall 6 at Stand A43, where the NIO ES8 will be on display.

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About Borealis Automotive: Driving Tomorrow

For over 50 years, Borealis has been a leading supplier of innovative polyolefin plastic materials for engineering applications in the automotive industry. Using its unique and proprietary Borstar® technology and its Fibremod™ post-reactor technology for fibre reinforced polypropylene (PP) compounds, Borealis delivers ideal replacement solutions for conventional materials such as metal, rubber and engineering polymers. Borealis continues to discover new material solutions which help facilitate lightweight construction and thus play an important role in enhancing energy efficiency. In automotive vehicles, Borealis' leading-edge polyolefin plastic materials are used in a wide range of exterior, interior, and under-the-bonnet applications, including bumpers, body panels, trims, dashboards, door claddings, climate control and cooling systems, air intake manifolds and battery cases. www.borealisdrivingtomorrow.com

About Borealis and Borouge

Borealis is a leading provider of innovative solutions in the fields of polyolefins, base chemicals and fertilizers. With its head office in Vienna, Austria, the company currently has around 6,800 employees and operates in over 120 countries. Borealis generated EUR 8,3 billion in sales revenue and a net profit of EUR 906 million in 2018. Mubadala, through its holding company, owns 64% of the company, with the remaining 36% belonging to Austria-based OMV, an integrated, international oil and gas company. Borealis provides services and products to customers around the world in collaboration with Borouge, a joint venture with the Abu Dhabi National Oil Company (ADNOC).

Borealis and Borouge aim to proactively benefit society by taking on real societal challenges and offering real solutions. Both companies are committed to the principles of Responsible Care®, an initiative to improve safety performance within the chemical industry, and work to solve the world's water and sanitation challenges through product innovation and their Water for the World programme.

For more information visit:

www.borealisgroup.com | www.borealisdrivingtomorrow.com

www.borouge.com

www.stopoceanplastics.com

www.waterfortheworld.net

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