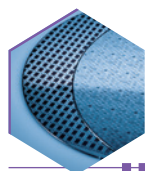


Contribution to Advanced Technology Innovation

As 5G and other technologies accelerate digital transformation, demand for semiconductors and displays is increasing. In addition, there are calls to reduce environmental impact through lower power consumption and greater efficiency in the manufacturing process. In light of these demands, the Digital Solutions Business will contribute to society through continued innovation and the development of new materials.



Semiconductor Materials Business Nanotechnology and power consumption

As mobile devices such as smartphones and cloud services enable a highly networked information society, and with the emergence of AI, advanced driver assistance systems for automobiles, and other elements of a smart society, semiconductor chips have continued evolving to offer faster processing, lower power consumption, and larger capacity. In collaboration with manufacturers in the global semiconductor field, JSR's Semiconductor Materials Business continues to lead the way in cutting-edge material technologies that enable the evolution of semiconductor chips.

It is said that if semiconductor circuit width can move from 14 nm to 7 nm, power consumption can be cut by roughly 40% while maintaining the same processing capacity. JSR will further refine its nanotechnology to support IoT, AI, 5G, and other elements of a smart society while lowering power consumption and saving energy.

In 2015, JSR established a joint venture with imec, a leading research institute in nanoelectronics technology, and began providing production and quality control services for extreme ultraviolet (EUV) lithography materials. EUV lithography is expected to be a key technology driving progress in the miniaturization and integration of semiconductors expressed by Moore's Law, even beyond the 7 nm threshold. Commercial production started in 2017.



Manufacturing joint venture (EUV RMQC)
* EUV Resist Manufacturing & Qualification Center N.V.



Display Materials Business JSR's alignment films boast the top share in the world

LC displays are composed of a number of films made of high-performance materials. JSR handles many such materials, but has a competitive edge in the alignment films used in liquid crystal arrays. JSR Group boasts the top share of the global market for display alignment films for 4K and 8K displays, which promise strong growth potential.

In 2019, JSR developed and began marketing a new grade of alignment film that enables low-temperature curing in the LC panel manufacturing process. Formerly, customer production lines required curing temperatures of between 200°C and 250°C, but the newly developed film is capable of a much lower 150°C curing temperature, which results in less energy consumed in the manufacturing process and is expected to reduce environmental impact.

JSR has actively been promoting digitalization in the development of alignment films and raw material polymers by utilizing data analysis and simulations to reduce the number of trial runs typically carried out on customer production lines, which led to faster development times. Going forward, the Group will continue to develop sustainable materials by leveraging greater digitalization in the R&D division for the development of new materials.



Chinese manufacturing joint venture (JMCH*)
* JSR Micro (Changshu) Co., Ltd.

Contribution to Advanced Technology Innovation

The automotive industry is undergoing a major transformation. With the advancement of electrification and autonomous driving, vehicle chassis are required to be lighter and more multifunctional than ever before.

In addition, calls are growing for innovations to reduce the environmental impact of automotive tires including extending product life and reducing rolling resistance, which aids higher fuel efficiency. JSR will contribute to the transformation of the automotive industry through its Elastomers Business and Plastics Business.



Elastomers Business

Benefits of SSBR

Fuel-efficient tires are environmentally-friendly and yet maintain their ability to stop safely and securely. JSR Group's polymerization SBR (SSBR) solution has received positive feedback from customers. JSR Group designed SSBR using technology that more readily facilitates rubber molecules and tire reinforcing material molecules to bond tightly, which reduces internal friction and rolling resistance*. In addition, this is achieved without changing the characteristics of the rubber that enables the tires to stop. SSBR allows large reductions in environmental impact throughout the entire lifecycle of the tire, from the material selection and its usage and disposal.

Automobiles are expected to still require tires even after automotive engines are replaced with electric motors. Thus, demand for SSBR is high both in countries and regions where environmental standards are high, such as Japan and Europe, and in emerging nations where reducing transportation-related environmental impact is an urgent issue. Amidst the rapid pace of automotive electric motor adoption, SSBR not only adds lower rolling resistance to tires, it also contributes to wear resistance and durability, thereby helping to maintain long-term performance. In addition, SSBR helps in meeting the growing demand for all-season tires that can be used year-round by adding a degree of softness that ensures tires with safe stopping performance in the summer can also provide reliable stopping performance on cold road surfaces.

JSR has developed a new, highly durable SBR. Optimized by combining JSR's proprietary molecular design and hydrogenation technologies, this polymer offers high fracture strength, wear resistance, and durability, enabling thinner treads, lower overall tire weight, and longer life compared with conventional tires of the same thickness. JSR Group is developing and marketing a series of new SSBR products offering the same kind of new added value.



SSBR before packing



Plastics Business

Monomaterials

The use of a single type of unpainted plastic makes recycling possible. By using anti-squeak materials, it is possible not only to ensure in-cabin quietness in vehicles, but also to reduce the overall number of noise suppression materials used. These plastics also lessen environmental impact by reducing the use of solvents in painting.

HUSHLLOY™ Anti-squeak Material

Friction at joints between plastic parts is a major design consideration because it can be the cause of unpleasant squeaking noises. HUSHLLOY™ styrene thermoplastic has revolutionary properties that prevent squeaking. In addition to reducing the upfront costs of implementing anti-squeak measures, HUSHLLOY's anti-squeak properties last for the lifetime of the product.

VIVILLOY™ Highly Colorable Material

Based on our proprietary polymer technology and experiences with other products, we developed a highly colorable material for paint-less applications. This product reproduces depth and vividness closely resembling paint for intricate applications and shapes. The elimination of the painting process contributes to lower overall cost and helps reduce environmental impact.



* Rolling resistance: Resistance in the direction opposite to the direction of tire rotation.