R&D

Aiming to Be a "Genuinely Development-Driven Company"

In April 2017, the Hitachi Metals Group opened the Global Research & Innovative Technology center (GRIT), a reflection of its principle to "promote research, development, and innovation for the future, to become a genuinely development-driven company." In April 2018, we opened a new facility within GRIT consisting of a research building and an experimental building. We will continue to invest in R&D on advanced materials that foster sustainable growth and contribute to society. At the same time, we will deploy AI, materials informatics, and other digital technologies to shorten product development periods.

Main R&D achievements in fiscal 2020

In fiscal 2020, the Group made investments in R&D totaling ¥14.5 billion and achieved the following results. We will contribute to advances in weight reduction and fuel and energy efficiency of products in fields related to industrial infrastructure, electronics, and automobiles, where electrification (xEV)* is making progress.

Specialty Steel Products

- We developed ZHD® 492, a high-performance die-casting mold steel with both high-temperature strength and toughness, by combining an alloy design that brings out high-temperature strength with a structure control process according to steel grade. This product is expected to help reduce mold repair workloads and improve the productivity and quality of die-cast products by extending the heat crack life in applications with high heat load.
- We are developing steel mill materials to improve the performance of organic EL panels for wide-screen TVs, as well as smartphones and other small- and medium-sized devices, and to expand the number of models that use them. We are also stepping up development of cladding materials for automotive lithium-ion batteries and new fields. In fiscal 2021, we will start mass production of products developed in fiscal 2020.
- We developed additive manufacturing recipes for ADMUSTER®-C00P, a high-corrosion-resistant, high-strength metal powder alloy for 3D printers; ADMUSTER®-C21P, a high-corrosion-resistant, nickel-based alloy; ADMUSTER®-W285P, low-Co maraging steel; and iron-chromium-cobalt magnets. We look forward to providing additive manufacturing products using unique metal materials.

* xEV: A general term for electric vehicles (EVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs)

Functional Components and Equipment

- In Singapore, we started demonstration tests of a ceramic adsorption filter that prevents clogging and damage to reverse osmosis membranes used in seawater desalination and other applications. We verified the effectiveness of the system for not only seawater desalination but also some industrial wastewater recycling, and we expect it for help reduce the frequency of cleaning and replacement of reverse osmosis membranes. We are also confident that the system will help lower desalination costs and operating costs for water treatment plants.
- We developed the "Pressure-type MFC (PS200 series)," equipped with a new pressure sensor. The new pressure sensor has a double-diaphragm structure with a metal diaphragm in the pressure-receiving section and a semiconductor diaphragm in the pressure-detecting section. It is a precision fluid control device with high-corrosion resistance, reproducible performance, and long-term stability, and we expect it to be used in high-quality semiconductor-manufacturing equipment.

Topics Development of Medical Silicone Cable with Excellent Sliding Properties and Chemical Resistance

Hitachi Metals has developed a new medical silicone cable that combines excellent sliding properties and chemical resistance by applying its proprietary surface treatment. This cable offers enhanced operability thanks to improvements to address surface tackiness, a disadvantage of silicone. We will recommend its application in medical devices that require frequent disinfection and sterilization, such as ultrasound diagnostic equipment, endoscopes, and catheters. We started mass production in early 2020, and the cable is being used in some medical devices.

Silicone, which has excellent chemical resistance, sterilization resistance, and biocompatibility, is widely used as a material for medical devices. When silicone is applied to the sheath (protective outer layer) of a cable, it provides high resistance to chemicals that disinfect the cable surface and can also be applied to high-pressure steam sterilization (autoclaving). With such excellent chemical and sterilization resistance properties, we expect our silicone cable to be applied to a wide range of medical devices in the future. In addition, medical devices used to diagnose patients with infectious diseases, such as COVID-19, need to be disinfected frequently, so we anticipate growth in demand for silicone cables with excellent chemical resistance. Due to its tacky surface, however, silicone tends to get contaminated by dust. It is also difficult for doctors to handle and causes discomfort when it touches a patient's skin.

The medical silicone cable we developed eliminates the problem of silicone's inherent tackiness. We achieved this by applying a proprietary surface treatment to the cable skin to deliver excellent sliding properties. To address the issue of declining sliding properties caused by repeated disinfection treatment, we designed the surface structure to withstand the stress caused by wiping with non-woven fabric impregnated with disinfectant solutions. Even after 10,000 test wipes using our evaluation method, we found that the silicone cable maintained sliding properties equivalent to or better than our PVC cables*. We also confirmed that it causes less discoloration than our PVC cables in various chemical solutions used in hospitals. We started mass production in early 2020 and are making prototype cables for various medical devices.

We will continue encouraging the adoption of our newly developed products in various medical devices. Our aim is to contribute to the evolution of advanced medical care by stepping up development of wires and cables for medical devices.

Medical silicone cable

* Cable using polyvinyl chloride as the protective outer layer

Magnetic Materials and Applications/Power Electronics

- We developed Hi-LoDe Lap™, a high-precision polishing technology for silicon carbide (SiC) substrates for power devices used in automobiles, trains, and industrial equipment, as well as Hi-LoDe Epi™, a low-defect SiC epitaxial film. We expect these technological advances to contribute to the miniaturization and higher efficiency of power semiconductor modules.
- We developed a high thermal conductivity silicon nitride substrate for mounting power semiconductor modules used in xEV inverters. It boasts a 30% improvement in thermal conductivity compared with our existing products and is suited for use as an insulating substrate for high-performance power semiconductors that require high reliability, such as Si-IGBT and SiC-MOSFET.

Wires, Cables, and Related Products

- We developed a cable for industrial robots that combines excellent bending resistance and signal transmission that satisfies the Category 6A standard. It will be used for robot vision in industrial robots, etc., and is expected to contribute significantly to labor saving and automation in factories.
- We developed a medical-use silicone cable that combines excellent sliding properties and chemical resistance. By applying a proprietary surface treatment to the surface of the silicone, we eliminated the issue of tackiness inherent in that material. Medical devices used to diagnose patients with infectious diseases need to be disinfected frequently, so we expect an increase in adoption of silicone cables with excellent chemical resistance.