High-Performance Materials That Help Realize a Sustainable Society

Our global environment faces many challenges, including rising sea levels and intensifying storms and floods resulting from climate change, as well as the depletion of resources and the loss of biodiversity. To address these challenges, we are pursuing environmental activities all over the world. The Hitachi Metals Group focuses on the development of key environmentally conscious products. At the same time, we contribute to realizing a sustainable society by providing high-performance materials to customers in a wide range of fields, such as those for automobiles and electric power.

Neodymium magnets: Contributing to popularization of xEVs

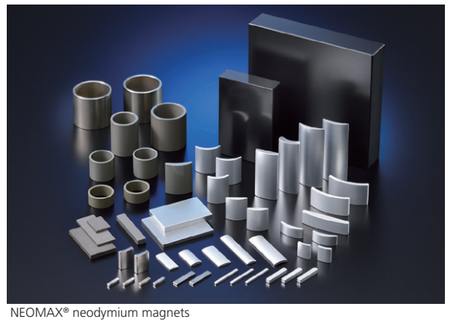
In 1982, our company (then called Sumitomo Special Metals) invented a neodymium magnet with a much stronger magnetic force than ordinary ferrite magnets. In general, a stronger magnetic force of a magnet means higher performance of the motor, which contributes to miniaturization and weight reduction. In light of technological advances in xEVs*1, neodymium magnets play a significant role, being indispensable for making motors smaller and lighter, thus increasing efficiency and saving energy. Boasting the world's strongest magnetic force among permanent magnets, NEOMAX® magnets are used in various fields, including those for automobiles, IT, home appliances, industry, medical devices, and environment and energy. Currently, we are focusing on increasing our presence in the automotive market, which is undergoing transformation due to advances in connectivity, automated driving, and electrification. Supplying high-performance neodymium magnets for around 1.18 million vehicles*2 annually, we contribute to higher efficiency and downsizing of xEV drive motors and generators.

*1 xEV: A generic term for electric vehicles (EVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs).
*2 Based on the Fiscal 2021 Medium-Term Management Plan

Sustainable use of rare earth materials

Neodymium magnets are expected to find more widespread use as companies work to realize an energy-efficient society. These magnets consist mainly of neodymium, iron, and boron, a composition that is vulnerable to heat and whose magnetic properties deteriorate when the temperature exceeds around 80°C. Therefore, it is necessary to add dysprosium (Dy) and terbium (Tb), which are heavy rare earth elements.

Neodymium and heavy rare earth elements are indispensable materials for the evolution of magnets, but since they are derived from natural resources, there are risks in terms of procurement stability and costs. Because it is difficult to reduce the amount of neodymium, which is the basic composition of the magnets, the Group has been developing the NEOMAX®F Series since 2014, reducing the amount of heavy rare earth elements while maintaining heat resistance. By limiting the use of rare earth elements, we contribute to their sustainability.


NEOMAX® neodymium magnets

Rare earth magnet business

We produce neodymium rare earth magnets (neodymium magnets), which are indispensable for advances in miniaturization, weight reduction, and operational and energy efficiency. They are used in motors in such fields as automobiles, IT, home appliances, industry, medical devices, and environment and energy. In the automotive field, they are used in xEV drive motors and generators.

	Contribution to SDGs	Value created
Environmental value	7.3 11.6 13.1	We provide high-performance rare earth magnets for xEV applications in order to improve fuel efficiency, reduce vehicle exhaust emissions, and enhance operational efficiency and miniaturization of xEV drive motors and generators, stemming from replacement of internal combustion engines with xEV motors. (Approximately 1.18 million vehicles/year equivalent) [Customer value created] Note: Based on the amount used and shipment volume for xEV applications Developing magnets that require less heavy rare earth resources (less heavy rare earth magnets) will reduce the use of such resources. [In-house value created]

Potential risk of business on society/environment	Response
Environmental destruction due to rare earth mining; poor working conditions	Procure from companies that care for the environment and working conditions

Amorphous alloys: Contributing to energy efficiency of power transformers

Transmission energy gets lost as electricity travels from the power plant to factories and homes. High-voltage electricity sent from the power plant is converted to low-voltage electricity by transformers. However, transformers not only consume power during the conversion, but also when in standby mode.

To solve this problem, the Hitachi Metals Group developed an amorphous alloy called Metglas®. Transformers using Metglas® as the core material consume around one-third of the power of those using conventional materials, such as magnetic steel sheets. We have been supplying this alloy since 2003. Amorphous alloys have excellent soft magnetic properties due to their lack of crystal structure, which makes it possible to suppress power loss in standby mode. The Group has provided core materials for 480,000 amorphous transformers, contributing to a reduction in CO_2 emissions*3 of around 50,000 tons*2 per year compared with those of conventional transformers. In March 2020, meanwhile, we announced the development of MaDC-A™, a new amorphous material that contributes to even higher efficiency in transformers.

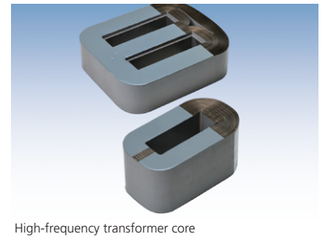
*3 Based on shipment volume and difference in transformer energy loss, according to Indian standards
For the CO_2 emission coefficient, we use IEA CO_2 emissions from fuel combustion (2017 world).

Targeting a global proliferation rate of 30% for high-efficiency amorphous transformers

Amorphous alloys are used in transformer cores to help save energy and reduce CO_2 emissions. However, the initial costs are higher than those for conventional transformers, and standards and regulations related to enhancing transformers' energy efficiency are inadequate. For these reasons, the global proliferation rate for amorphous transformers is only 14%, according to our research. The Hitachi Metals Group is working to develop materials aimed at reducing the initial costs. Also, we are seeking to establish appropriate evaluation benchmarks through lobbying activities targeting governments, electric power providers, and electric transmission companies, while providing our expertise to amorphous transformer manufacturers. Our goal is to achieve a global proliferation rate of 30%, which will lead to reductions in CO_2 emissions of more than 4.6 million tons per year, equivalent to the emissions of 32 coal-fired power plants (each with a 1 million-kilowatt capacity).

Since amorphous alloys can also help enhance the energy efficiency of products other than transformers, we anticipate a significant emergence in demand. We will work to minimize environmental impacts in more domains by developing new production and processing procedures for amorphous alloys.


Metglas® amorphous alloy ribbon


High-frequency transformer core

Soft magnetic materials business

We produce soft magnetic materials used in energy-saving transformers and noise suppression components in industrial and electronic equipment.

	Contribution to SDGs	Value created
Environmental value	7.3 13.1	Compared with transformers using conventional materials, such as grain-oriented magnetic steel sheets, the no-load loss (standby power) of those using amorphous alloys is low, at around one-third. We provide high-efficiency amorphous transformer materials that can significantly reduce power conversion loss (used in around 480,000 transformers). This translates to an annual CO_2 emission reduction of around 50,000 tons compared with transformers using grain-oriented magnetic steel sheets. [Customer value created]

Potential risk of business on society/environment	Response
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