

FOREWORD

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Initiatives to achieve carbon neutrality as a countermeasure against global warming are accelerating. Because the steel industry is a major source of CO₂ emissions, steel makers are naturally grappling with CO₂ reduction in their production processes, while also attaching increasing importance to contributing to CO₂ reduction in society as a whole through eco-products.

Since it is assumed that electrification in the automotive industry will accelerate at an increasing pace in the future, the performance of magnetic materials, rather than conventional engine performance, will become a key factor which determines vehicle performance. Diversification and higher functions in the performance required in magnetic materials for electric vehicle (EV) traction motors is assumed. These requirements include high magnetic flux density for acceleration performance, high speed rotation and high strength for high output, and low iron loss to extend travel range of vehicles and reduce on-board battery sizes. In auxiliary motors as well, it will also be necessary to respond to weight reduction and new applications supporting space saving and complex motor geometries.

In the field of electric power infrastructure, regulations requiring higher efficiency in electrical equipment are progressing in countries around the world in response to environmental problems, and requirements for high magnetic flux density and low iron loss are increasing year by year. At the same time, diversification and use of advanced technologies in electric power supply systems are accelerating, as seen in solar power, wind power and other forms of renewable energy, and in large-scale DC power transmission.

In addition, requirements for high frequency applications are also increasing in the field of reactors and inductors, which are key components of electrical equipment.

Amid such changes in the demand environment, the JFE Steel Group has repeatedly developed new technical innovations, and has established a system that can meet the diverse, wide-ranging needs of customers as a total supplier with a wide line-up of soft magnetic materials from electrical steel sheets to iron powder and ferrite. We have developed and commercialized a number of innovative products such as domain-refined grain-oriented electrical steel with low iron loss contributing to high efficiency in transformers, non-oriented electrical steel

with high magnetic flux density, high strength and lower iron loss suitable for EV traction motors, electrical steel sheets (Super Core™) for high frequency electrical equipment such as reactors, an insulated pure iron powder (Denjiro™) supporting downsizing and complex shapes of motors, and MnZn ferrite for use in compact transformers and noise filters. We are also working to expand our use and evaluation technologies so that the features of these products can be utilized to the fullest extent in improving the performance of electrical equipment. This Special Issue introduces the progress of a wide range of magnetic materials and evaluation technologies, together with the most recent status of product and technology development.

Based on the Corporate Vision of the JFE Group, “Contributing to society with the world’s most innovative technology,” we will continue to promote the development of technologies and products that are attractive to customers in order to contribute to the decarbonization of society. In the future as well, we sincerely request your further guidance and patronage.