FOREWORD

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In response to the rapid progress in IT in recent years and increasingly serious environmental and energy saving problems, higher functionality, including more compact size, weight reduction, thinner profiles, higher capacities, higher speeds, and higher efficiency, as well as improved safety, are demanded in electrical and electric machinery parts such as motors and transformers, and their housings, for personal computers, cellular phones, and other electronic devices and automotive and home appliance products. Higher performance, fine grain structures, suitability for high frequency use, and environment-friendliness are among the properties demanded in the materials used in these products.

JFE Steel's basic steel products such as sheets, plates, and tubular products are widely used in fields such as automobiles, shipbuilding, and civil engineering, but the company also offers a wide line of products with excellent properties and unique products to meet the needs of electrical machinery and electrical/electronic devices. This "Special Issue on Materials for the Electrical and Electronic Industries" introduces the JFE Steel Group's products in the fields of "magnetic materials," "electronic materials," and "environment-friendly materials."

In the field of "magnetic materials," the JFE Steel Group has commercialized materials for a wide range of frequencies, including electrical steel sheets, iron powder, and ferrite cores, responding flexibly to customers' needs. As electrical steel sheets, which are one of JFE Steel's main products, the company has newly commercialized high-Si electrical sheets for use as core materials, meeting the needs of higher frequencies in reactors, and electrical sheets for cores of segmented motors, responding to higher efficiency in motors. At the same time, the company has also developed an evaluation technique for optimizing motor design. In ferrite products, the JFE Steel Group has commercialized ferrite for power supply use, which features low loss at high saturation flux densities, and ferrite for EMI with high resistance and high permeability. The JFE Steel Group has also developed a number of unique materials, such as ultrafine oxidized iron powder with an average particle size of less than 0.1 μm for use as a material for chip inductors, ultrafine pure iron (UFPI) powder with

an average size of less than 1 μm for powder cores, meeting the needs of higher inductor operating frequencies, and pure iron for high performance shielding use.

Among "electronic materials," this issue introduces metallic ultrafine powder and piezoelectric materials for condensers, and electrode materials for lithium ion secondary batteries and capacitors. As a material which meets the needs of miniaturization and higher capacities in condensers, ultrafine Ni powder with an average particle size of 0.2–0.4 μm is used as an internal electrode material for laminated ceramic condensers, and ultrafine Nb powder has been developed as a positive electrode material for electrolytic condensers. In secondary cells, lithium ion secondary batteries have become the mainstream from the viewpoints of light weight and high capacity. The JFE Steel Group has therefore commercialized mesophase fine carbon (KMFC) as a negative electrode material for lithium ion secondary batteries and lithium nickelate as a positive electrode material. At present, lithium ion secondary batteries are mainly used in mobile devices such as cellular phones and personal computers, but on-board use in automobiles such as hybrid cars and electric cars is also expected in the future. Every effort is being devoted to improvement for these applications. Electric double layer capacitors which enable rapid charging/discharging have also attracted attention, and JFE Steel Group has developed high capacity activated carbon manufactured by a proprietary method as an electrode material for these devices. The resonators used in cellular phones are also a unique product of the JFE Steel Group and achieve high corrosion resistance with a plating-free design. This issue also introduces ultrathin planar inductors for DC/DC converters and high conversion efficiency piezoelectric single crystals.

In the field of "environment-friendly materials," this issue introduces several types of chromate-free steel sheets, called ECO FRONTIER, which respond to regulations on the use of harmful substances in electrical products. In the past, chromate treatment of galvanized steel sheets was widely adopted as an economical rust-preventive method which suppresses white rust caused by zinc, but with heightened environmental protection in recent years, there have also been progressive moves to restrict the use of environmental load substances, and an accelerating trend toward chromate-free products is likely in the future. JN is chromate-free and is the world's first steel sheet to realize high level corrosion resistance with a thin film, and also offers high electrical conductivity. JFE Steel's black steel sheet, Z1, has an excellent heat absorption/radiation property. These products are widely use as inner/outer sheets for home electric appliances and OA and AV equipment.

As outlined above, the JFE Steel Group has a wide range of products in the fields of electrical/electronic materials, and is also developing leading-edge products which will be

useful to customers in the future. We look forward to the requests and suggestions of all our customers, and we request your continuing support and patronage.