

FOREWORD

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It is often said that we are living in an “age of digitalization,” but this digital age would not be possible without the infrastructure products that support it, and the functional materials that make up those products have become one of the greatest current strengths of Japanese companies. For example, in 2018, the Ministry of Economy, Trade and Industry (METI) identified the basic materials industry as a “leading industry” in Japan. Functional materials are also a key global market with a value of approximately ¥50 trillion/year (2015), and Japanese companies have a high share of electronic materials and other functional materials used in lithium batteries and liquid crystal displays. In fact, it is no exaggeration to say that the high functionality and multifunctionality of Japan’s materials determine the materialization of added value and differentiation of many of the world’s most advanced digital products.

As also introduced in this Special Issue, companies in the JFE Group have commercialized many functional materials which are already used in practical applications, and a number of them are contributing to profitability. Moreover, even when a functional material originates from JFE Steel itself, it is frequently a group company that does the steady, step-by-step work necessary to develop and commercialize that material. Technologies without application in the field of steel are selected by group companies, where they acquire a high evaluation and market share and blossom even in a niche field compared to steel products. Examples of extremely promising functional materials that were commercialized by JFE Group companies include high-Ni positive electrode materials and hard carbon and other negative electrode materials for lithium ion batteries, soft ferrite cores, phenol resin, Ni ultrafine powder, piezoelectric single crystals, boron nitride, stampable sheets, indene and fluorene.

However, in recent years, there have been situations where the limitations of human, financial and other resources in individual JFE Group companies have made it impossible to respond fully to various needs, such as a quick, flexible response to needs in user industries, high quality and speed in innovations that enable development proposals which anticipate those needs, and the corporate strength to cope with the increasing costs of research and development and capital investment. Therefore, in 2017, JFE Steel established the Functional

Material Research Department as an integrated group organization for innovation in materials. Centering on analytical capabilities which we originally developed in steel-related research, this department has made an important contribution to strengthening the technological infrastructure of the high functionality materials of JFE Group companies.

This Special Issue introduces the contribution of functional materials to the field of electric vehicles (EVs), that is, CASE (Connected, Autonomous, Shared and Electric) and MaaS (Mobility as a Service), where particularly large growth is expected in the future. At the same time, this Special Issue can also be considered an opportunity for open innovation. We hope that our readers will see the diverse range of functional materials available in the JFE Steel Group and produce future material innovation, and can develop and commercialize functional materials that make significant contributions to the material industry in Japan. We also hope to create an environment that will enable efforts in the growth field of functional materials in the JFE Group as a whole through cooperation with the Functional Materials Research Department.