



## Remarks on Special Issue on Fundamental Materials Science and Engineering

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*It is our great pleasure to publish this Shinnittetsu Sumikin Giho special issue featuring fundamental materials science and engineering to share part of the achievements from researches in this field with customers, researchers at universities and research institutes, and students.*

*The materials industry in Japan has been significantly contributing to the enhancement of the competitiveness of industries in the country in cooperation with other industries in an organic and harmonious manner. However, taking for example the materials technologies that have been Japan's strength, the international competitiveness in this field in both industrial circles and academia has significantly decreased compared to other countries. Therefore, a new paradigm shift is urgently required.*

*As we have only succeeded in extracting a very small part of the materials' potential so far, materials still have enormous potential to exercise. Therefore, if we can dramatically improve material properties thereby enhancing the functions of customer products to a significant extent, we can further contribute to society. This is our dream; however, to fulfill this dream, we must overcome several technical issues.*

*The mission of fundamental materials science and engineering is to produce seeds of innovative technologies that will bloom in the future based on the long-term vision to be a steelmaker with world-leading capabilities. To achieve this, challenging untouched areas is required to make the leap from the current situation. Proposing new guiding principles by further investigation is also necessary. As shown in the papers in this special issue, the applicable technology fields are: (1) Researches on new structures and properties of bulk materials focusing on steels along with new processes to realize these structures and properties; and (2) surface science researches for further improving the functions and quality of bulk materials. Nippon Steel & Sumitomo Metal Corporation is expected to thoroughly investigate these fields to play a leading role in the technological innovation.*

*To this end, in addition to conventional approaches, we will take on interdisciplinary activities in which different areas are fused, basic researches that cannot be done in other industrial sectors, and challenges that lead to discontinuous leaps, in order to offer new technologies to*

*parties with whom we cooperate. For such approaches, it is essential to closely cooperate with related sections in the company, users outside the company, and academics and government organizations. Also, multiscale and multi-physics analysis researches from the order of atoms and electrons to bulk materials, in which leading-edge analysis techniques and computational materials science are used, are also essential. These activities can in turn develop human resources, which is of vital importance.*

*In this special issue, (1) the bulk metallurgy is covered contributing to the high-level control of structures and properties as a result of the interaction between obstacles originated from structures and dislocation; and (2) the surface science is also covered to fuse the electronic theory and thermodynamics with surface reactions and tribology. These studies attempt to solve fundamental issues and true nature, applying analysis techniques such as advanced X-ray analysis, Raman spectroscopy, and in-situ observation, along with computational materials science such as first-principles calculation, molecular dynamics method, and phase-field models.*

*We hope that readers will understand our enthusiasm for fundamental materials science and engineering and expectations for the future from this special issue. It would also please us immensely if this special issue assists in the start of new cooperation in the fields of R&D and manufacturing both in and outside of the company.*