FOREWORD

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Since modern steel manufacturing began, there have been increasing demands for high performance in iron and steel products and supply of iron and steel products with stable quality. Chemical analysis and microbeam analysis techniques are one of important fundamental technologies that have supported the development and manufacturing of those products. Moreover, analytical techniques are increasingly important today, as steel manufacturers strive to realize higher performance and functionality in iron and steel products in response to the needs of society.

JFE Steel is a world leader in the development of advanced analytical techniques which make it possible to visualize the invisible and quantify the undetectable, and uses those techniques to promote product and process development. For example, JFE Steel has developed electron microscopy techniques that enable accurate evaluation of nanometer-sized precipitates and complex steel microstructures, and actively utilizes those techniques in the development of ultra-high tensile strength automotive materials which satisfy both high strength and high ductility. JFE Steel has developed sub-ppm-level trace analysis techniques which make it possible to realize production processes for ultra-high cleanliness steels that can withstand severe use environments. In order to elucidate the material properties at various scales and from various viewpoints, the company has also taken on the challenges of neutron beam techniques and computational material science. JFE Steel is pioneering and promoting the application of analytical techniques to further reduce environmental loads in the steel industry with the aim of realizing a sustainable society in the future.

Members companies in the JFE Group are also grappling with the development of attractive products and solution of problems by introducing or developing unique analytical techniques. In addition, group companies are improving leading-edge analytical techniques established by JFE Steel in line with customer needs in various industries, and providing total solution services to the customers.

This Special Issue introduces recent activities relating to analytical techniques of the JFE

Group. After describing the history and future outlook for chemical and microbeam analytical techniques in the Group, recent topics are reported. I hope that our readers will feel that our energetic efforts in advanced analytical techniques, which have been passed on seamlessly from our predecessors, are indeed the driving force of technological development in the JFE Group.

The aim of the JFE Group is to contribute to society by providing the world attractive new products and technologies that have not existed heretofore. In order to lead breakthroughs based on accurate understandings of principles and mechanisms, and trigger innovations by the discovery of new phenomena and functions, we will continue to challenge new analytical techniques and application technologies. In these efforts, I appreciate the guidance and encouragement of all our customers, colleagues and friends.