Preface to the Special Issue on “Ultrafine Grained Steels”

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Many studies have been conducted so far for grain refinement in various kinds of steels in order to improve strength–toughness balance. Especially, for the last decade, tremendous efforts have been made throughout the world to refine grains down to 1 μm in steels. Upon such backgrounds, the International Symposium on Ultrafine Grained Steels (ISUGS) was initiated by The Iron and Steel Institute of Japan (ISIJ) first in Fukuoka in 2001 in order to discuss fabrication process, microstructure characterization and mechanical properties of ultrafine grained steels. The 2nd and 3rd symposiums were held in Geelong, Australia and in Hainan Island, China in which the other metallic materials are covered as well as steels. During this period, physical metallurgy of ultrafine grained steels has advanced with particular interests on structure-property-processing relationship. Microstructure characterization and mechanical properties of ultrafine grained steels produced by various routes with phase transformation, deformation and recrystallization have been studied extensively. In addition, a considerable amount of focus has been placed on strength, elongation, toughness, and their trade-off balancing. Very recently much attention has been given to enlarge process windows for exploring the commercial production of bulky ultrafine grained materials.

The 4th symposium (ISUGS-2007), again organized by ISIJ, was held in Kitakyushu, Japan on October 24–26, 2007. The purpose of this symposium was to summarize our knowledge of the fundamental and up-to-date research

progress on ultrafine grained steels for the next generation. Invited speakers reviewed both science and engineering of ultrafine grained steels in the fields of

- (1) Microstructure Characterization
- (2) Mechanical Properties
- (3) Fabrication Process

Poster presentations were also delivered as contributed papers related to fine grained steels. The symposium was quite successful with those excellent presentations and active discussions among the attendants more than one hundred.

In planning this symposium, the organizing committee felt that it is important to convey excellent reviews to many steel researchers, especially to young researchers. Thus, it was decided to ask the invited speakers to write review papers for the special issue of ISIJ International whereas the content of ISUGS proceedings was limited only to the contributed papers. This is how the special issue consisting of numbers of review papers related to the physical metallurgy and processing of ultrafine grained steels, with substitution of several new contributed papers, was conceived. On behalf of the editors of the special issue, I am grateful to all the authors for their contribution. We hope this issue is useful to many researchers to update the recent advances and to explore the prospective aspects in steel research for the 21st century.