Preface to the Special Issue on "Effects of Cu and Other Tramp Elements on Steel Properties"

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The usage of scrap iron has become very important in the steel making from the view points of energy and resource conservation. Furthermore scrap iron now poses a serious environmental problems. Its usage, however, is limited because of the tramp elements such copper and tin in the scrap iron which deteriorate hot workability and performance of the products. Many researches on these effects of tramp elements were carried out in nineteen sixties and nineteen seventies in Japan, United States, Belgium and other countries. For instance, in Japan, the activity of the 19th Committee on Steel Making at the Japan Society for the Promotion of Science was remarkable and excellent books gathering the research results have been published. In this period, international exchange of the information of such researches was also briskly promoted as seen in the activity of the INCRA (International Copper Research Association) on the research on copper in steels. After these two decades, however, the number of the researches in this field decreased noticeably although refining technologies of decreasing contents of carbon, nitrogen, oxygen, phosphorus and sulfur in steels have shown a distinguished progress together with marked developments of background science and technology like chemical and physical microanalyses and computation of phase equilibria. Therefore, it now appropriate to examine and summarize the effects of tramp elements on steel properties using steels of which chemical composition are well controlled and using advanced analyzing and computing techniques, hence in this special issue of ISIJ International.

This special issue contains a review and 14 papers. The

review is describing clearly the present circumstances of scrap iron and technological development of the scrap reclamation in Japan. The fourteen papers are conceived to be the most up-to-date research results on the tramp elements on steel properties and fall into four scopes.

- (1) Hot Workability of Steels
Hot shortness and ductility concerning with and without preferential oxidation of iron and consequent copper concentration, and Solid/Liquid equilibria in iron-copper based systems.
- (2) Scale Properties
Removability of oxide scales in hydraulic descaling and failure of the scales during cooling.
- (3) Phase Transformation, Precipitation, Microstructure and Mechanical Properties of Steels
Transformation from austenite to ferrite and martensite, precipitation of copper in steels, tensile properties and cold-forgeability.
- (4) Surface Science and Technology
Corrosion behavior and alloy layer formation in hot-dip galvanizing.

Almost all papers were the fruits of the activity of the Committee on the Effects of Tramp Elements on Steel Properties which run four fiscal years from 1993 to 1996 in ISIJ. These papers show remarkable achievements in the respective research field and we anticipate that this special issue will promote the further development of the usage of scrap iron. As a Chairman of the Committee on the Effects of Tramp Elements on Steel Properties and an editor of this special issue, we are grateful to all the authors and reviewers for their efforts.