Preface to the Special Issue on “Challenge and Progress of Process Technology and Fundamental Research for the Promotion of Lime Dissolution into Slag”

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On the preface of the special issue of “Challenge and progress of process technology and fundamental research for the promotion of lime dissolution into slag”, some words cordially would be given with gratitude to this publication. Recently, a growing attention has been paid for the promotion of lime fluxing in order to meet the recent demands, that is, high efficiency and rapid operation of refining processes, which realize reduction of slag emission and suppression of calcium fluoride as well as shortening the operation time.

To tackle this challenging issue, much effort has been made during the recent decade with remarkable progress and development which invented very successful process such as CaO powder injection, adjustment of initial slag composition, optimization of oxygen blowing process and control of thermal conditions etc. In addition to these traditional countermeasures, new ideas and concepts have been awaited and innovative processes are recently proposed, namely, utilization of gas generation from quick lime and application of ultrasonic vibration, which would be a breakthrough for the promotion of lime dissolution. Developments of these processes should be extensively followed by elucidation of rate-controlling mechanism with respect to the formation of 2CaO·SiO₂ and investigation of systematic thermodynamic data regarding complex multi-component system such as CaO–SiO₂–FeO–P₂O₅ quaternary, as well as kinetic and thermo-physical properties of the formed slag.

For the intensive and collaborative activity toward the total understanding of this challenging research fields, a research group for “the optimal slag formation to promote the lime dissolution” has been organized and promoted during fiscal years of 2013 through 2015 in the platform of ISIJ by many active committee members from universities and industries as follows, Tohoku University, The University of Tokyo, Tokyo Institute of Technology, Nagoya Institute of Technology, Kyoto University and Kyushu University from academic fields, Nippon Steel & Sumitomo Metal Corporation, JFE Steel Corporation, Kobe Steel, Ltd., Daido Steel Co., Ltd., Nippon Yakin Kogyo Co., Ltd., Nisshin Steel Co., Ltd., Yoshizawa Lime Industry Co., Ltd. from industrial fields.

This special issue features the progress of process technology and fundamental research for the promotion of lime dissolution into slag mainly through this research group activities and achievements, parts of which have been intensively and continuously discussed in the specific periodic meetings by eight times, technical and international sessions and symposiums held in ISIJ academic meeting venues. It should be a great pleasure for all the members of this research group and those who are related to this field if this special issue would make not a few contributions to the development of steelmaking processes considering the promotion of lime dissolution into the slag.

Finally, I wish to express my utmost gratitude to all the committee members of this research group, all the participants in their hosted meetings and symposiums, and all the staff members who have greatly and patiently supported the publication of this special issue.

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