Preface to the Special Issue on “Recent Progress of the Research on the Iron Ore Agglomeration Process”

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The properties of iron ores used in Japan have been drastically changed in the past 15 years. This was mainly caused by the increasing use of Australian ores containing a large amount of goethite, i.e., compound of iron oxide and water. Typically, the proportion of pisolithic ores, which are coarse goethite ores, has remarkably increased by about 3 times. Further, the large deposits of fine goethite ores called “Marra Mamba” have been exploited in Australia and started to export. Such trends are forecasted to continue in future. Since the change of the properties of used ores affects not only to the productivity and yield of sinter but also its metallurgical properties in the blast furnace, further improvement in the sintering technology/process is urgently required including the preliminary treatment process of raw materials.

This special issue is aiming to open the results of the wide researches made by the “Research Project for Porous Meso-mosaic Texture Sinter” of the ISIJ together with the relating papers to the iron ore agglomeration processes. Ten papers appeared in this issue are directly related to the research project. This project was started in 2001 and carried on the wide range of studies for three and half years. Its main objects are the characterization of goethite ores and the quantification of its effect on the iron ore sintering process. It consisted of ten members from five universities and 16 members from six Japanese integrated steelmakers.

The research project was composed of four research groups (Fig. 1):

Group I. Characterization & Granulation of Iron Ores
• Extraction and evaluation of physical parameters of iron ores significantly influence on their granulability
• Development of DEM (Discrete Element Method) simulation model on the granulation

Group II. Characterization of Melt & Mineral Phase
• Crystal structure determination of multi-component calcium ferrite, which is a major mineral phase of sinter
• Establishment of essential phase diagrams for the melt formed during the sintering process
• Metallurgical property evaluation for the oxide phases containing high FeO

Group III. Quantification of Sintering Process
• Estimation of the relation between the iron ore properties and the change in void structure of the sintering bed
• Application of the advanced technique to evaluate the strength of mineral phases
• Development of simulation model to estimate the total strength of sinter through its mineral composition/structure

In order to create a new process principle/image based the results of the above studies, the following working group was set up:

Group IV. Practical process image consideration

According to the number of discussions and examination, a new agglomeration concept called MEBIOS (Mosaic Embedding Iron Ore Sintering) process was proposed. The results of the research project are outlined in the review paper, by Usui and Kawaguchi, and their details are described individually in this issue.

Significant contributions are also made by the iron ore distributor and users including seven papers from overseas and it covers a wide range of topics up to the environmental & dust recycling subjects.

Editors of this special issue appreciate the contributions of all the authors and hope that these papers help to a breakthrough for the future issues on the iron ore resource.

Fig. 1. Research groups and major subjects of the “Research Project for Porous Meso-mosaic Texture Sinter” of ISIJ.