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Biography

I learned process metallurgy and studied on the blast furnace process as a graduate student in Nagoya University for 5 years from 1964 to 69 under the supervision of Professor Iwao Muchi. After graduation, I worked on research and education in Tohoku University for 36 years from 1969 to 2005. In 1975 Sept. – 76 Aug., I studied as a post-doctoral researcher in Professor Julian Szekely's Laboratory at the State University of New York at Buffalo for one year. My main research field has been high temperature process metallurgy covering ironmaking processes such as blast furnace, sintering machine, shaft furnace, and utilization of low quality raw materials including waste materials, contribution to global environment through CO₂ emission reduction based on the transport phenomena theory and thermodynamics.

Research results have been published as over 200 original papers, which are classified as the following 7 categories:

1. Blast Furnace Modeling
2. Scrap Melting
3. Exergy Analysis
4. Laterite Processing
5. Recovery and Utilization of Waste Thermal Energy
6. Reduction of CO₂ Emission and Methanol Synthesis
7. Self-Propagating High Temperature Synthesis (Combustion Synthesis)

The mathematical model of the blast furnace developed, which can evaluate production rate and energy efficiency together with estimation of in-process phenomena like fluid flow, heat transfer and chemical reactions in three dimensions, therefore very useful for the production control and also improvement of practical operations. The model is being used worldwide in academic and industrial researches by the researchers who studied in my laboratory in Tohoku University. The scrap melting shaft furnace proposed is a superior process to decrease CO₂ emission. The energy evaluation technique applying exergy analysis has already used widely in Japanese ironmaking industry to realize reduction of energy consumption in industrial processes. Laterite processing was studied and an effective method was proposed to use low quality laterite ores. Energy recovery and CO₂ emission reduction which are strongly requested to ironmaking industry were studied and some new processes and technologies to realize effective operations of conventional ironmaking processes were proposed. Combustion synthesis was applied to

propose a low energy consumption process for synthesizing useful materials to recover waste thermal energy.

To these outstanding research results, Iron and Steel Institute of Japan awarded the institutional prize (2006) and nominated me as an honorable member of ISIJ (2014). In addition, I received honor citation by ICSTI (International Conference on Science and Technology of Ironmaking) at the 6th conference (2012), award for distinguished contribution on steering from 54th committee (Ironmaking) of Japan Society for Promotion of Science (2003) and award for scientific exchange between Brazil and Japan from the organizing committee of Brazil-Japan symposium for the establishment and management of the symposium (2004). This series of symposium is still continuing and the 10th symposium is planned to be held in 2017.

In my educational activity, 25 students were studied in my laboratory in Tohoku University between 1983 and 2015, and received PhD degree. Eight of them are now working in China, Malaysia, Indonesia, Brazil and Philippines as university professors or high level researchers in a national research center. Another eight of them are working in Japanese universities as professors and five of them are working as research managers in iron- and steel-making companies in Japan. Remaining four of them are working in some companies outside Japan. They are playing important roles in spreading and improving the research results and methods they acquired in my laboratory.

In addition, some company researchers and post-doctoral researchers from France, Ukraine, China and Japan studied in my laboratory, who also contributed to spread our research results widely.

As social activity, I worked as chairman in several research committees on blast furnace process from 1989 to 2005 and also in some steering committees in ISIJ (Iron and Steel Institute of Japan) from 1985 to 2005 and JIM (The Japan Institute of Metals and Materials) from 1993 to 2005. The research committees contributed much to the advancement of ironmaking technology.

After retirement from Tohoku University in 2005, I stayed for study at foreign universities such as University of Sao Paulo (Brazil), University of New South Wales (Australia), Prince of Songkla University (Thailand) and Korea Advanced Institute of Technology (South Korea) as visiting professor. During the stay I co-worked with the professors in those universities and gave advices to PhD students for their research on ironmaking. I think this work contributed to exchange up-to-date information in ironmaking research field.

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