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STUDY ON REDUCTION PROCESS OF METAL OXIDE UNDER MICROWAVE IRRADIATION

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Chemical reactions carried out under microwave irradiation often have high reaction rates and high selectivities, which enable compact reactor sizes and energy-conservation processes. Thus, microwave chemical processing and chemical synthesis have attracted considerable interest, as they will be employed for greatly improving process efficiencies and conserving energy for realizing Green Chemistry or Green Engineering. We have applied this technology to reduction process of several metal oxides, such as magnesium oxide, scandium oxide, copper oxide, and magnetite. It was found that those reduction processes has been done with low temperature under microwave irradiation in comparison with conventional heat process. Sometimes, oxide does not absorb microwave energy well and does not generate heat well. So, when electrical conductivity material used as a reducing agent was mixed with metal oxide and made into an antenna structure, it became easier to absorb the microwave energy and reduce the temperature. In smelting of magnesium, we have successfully obtained small amount of magnesium metal using a microwave irradiation with high yield of 71%, and also showed quarter of energy consumption in comparison with conventional process, which is called Pidgeon process.

Biography

Satoshi Fujii was born in Osaka, Japan, in 1962. He received his BS and MS degrees in Material Science from Tsukuba University, Ibaragi, Japan, in 1985 and 1987, respectively. He received his PhD degree in Material Engineering from Kyoto Institute of Technology in 2007. In 1987, he joined Sumitomo Electric Industries and engaged in research on GaAs ICs in Opto-electronics Laboratories. Since 1992, he has been with Itami Research Laboratories, engaged in research on diamond SAW devices. In 2004, he moved to the Advanced Technology Development Center, Seiko-Epson Corp., in order to study diamond SAW devices and related modules. In 2009, he moved to Chiba University in order to encourage PhD students to become leaders in industry, and to continue his studies on diamond SAW devices and microwave chemistry with Prof. Wada. In 2015, he joined the faculty of the National Institute of Technology, Okinawa as a Professor.

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