

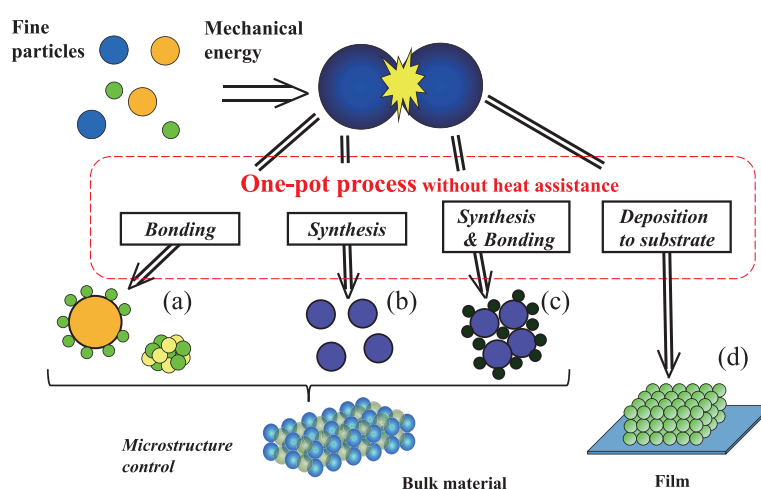
The KONA Award 2019

The KONA Award 2019 was presented to Dr. Makio Naito, Professor of Joining and Welding Research Institute, Osaka University, Japan. He has conducted ground breaking and foundational studies contributing to novel powder processing technology to develop advanced materials to address energy and environmental issues. He aimed to develop smart powder processing techniques to support green and sustainable manufacturing of advanced materials. He has proposed and advanced new concept to achieve direct bonding between particles by activating their surfaces with mechanical energy, without any externally applied heat or added binders of any kind in the dry phase. By introducing controlled composite particles made by the direct bonding as precursors, new microstructure electrodes for Molten Carbonate Fuel Cells (MCFC) and Solid Oxide Fuel Cells (SOFC) have been created. Based on this concept, Professor Naito has produced electrodes for SOFC that operate at lower temperature, and developed other new materials such as fibrous nanoparticle compacts having high thermal insulation performance at the high temperatures. By making use of particle bonding, he has developed a new one-pot processing method to synthesize nanoparticles without applying extra heat. Furthermore, the one-pot processing method can combine the synthesis of nanoparticles and their bonding with other particles to make nanocomposite granules in one step. Nanostructured granules of active materials for the cathodes and anodes for lithium ion batteries have been successfully synthesized by this novel method. Now, Professor Naito is developing electrodes for all-solid-state lithium ion batteries in collaboration with industry partners to reduce the huge thermal energy consumption traditionally required to manufacture high quality powders and ceramics.

Professor Naito has also conducted research on powder processing to increase the performance and reliability of advanced ceramics, which is a very important issue in engineering ceramics. He has developed characterization tools to examine the evolution of large defects in ceramics during processing. Applying these tools in the ceramics manufacturing process, he has elucidated the failure mechanism, and demonstrated that very few large particles and/or large pores will significantly degrade the fractural strength of ceramics manufactured through traditional routes. His achievements and publications have been cited by numerous researchers, and are recognized in many review articles and journals worldwide. Several characterization tools developed by his research group have been adopted by the International Organization for Standardization (ISO) for Technical Committee, TC 206 (Fine Ceramics).

As President of The Society of Powder Technology, Japan, he has contributed significantly to the development of powder technology, and presented many lectures to various material researchers on developing innovative synergetic materials. He also has contributed to the publication of many books to establish a foundation of international infrastructure on powder technology. The “Nanoparticle Technology Handbook” published by Elsevier is one example of the books he has edited.

Due to the worldwide problems with the COVID-19, the presentation ceremony of the KONA Award 2019 did not take place at the 54th Symposium on Powder Technology, which had been originally planned to be held in September, 2020 in Tokyo, Japan but decided to be postponed.



Selected research achievements for the KONA Award 2019: One-pot processing methods developed by applying particle bonding principle.