The 21st KONA Award

Dr. Yoshio Sakka, Managing Director of the Materials Processing Unit at National Institute for Materials Science (NIMS), was selected as the winner of the 21st KONA Award, which is sponsored by Hosokawa Powder Technology Foundation and given to the scientist(s) or group(s) who have achieved distinguished research works in the field of particle science and technology.

He received his B.E. in 1978, M.E in 1980, and Ph.D. in 1983 from Kyushu University. He joined the National Research Institute for Metals (presently NIMS) in April 1983. He became a Group Leader in April 1997, led the Fine Particle Processing Group from April 2002, and was Managing Director of the Nano Ceramic Center from April 2005 to March 2010, before taking up his present position. In 1991–92, he spent a year at the University of Washington in Seattle, USA.

He has been a member of the board of the Ceramic Society of Japan (May 2007–May 2011 and May 2013–May 2014), the Society of Inorganic Materials, Japan (May 2007-present), and Japan Society of Powder & Powder Metallurgy (May 2011-present). He currently serves as an editor of Science and Technology of Advanced Materials (International), Journal of Materials Science Society of Japan, Journal of Inorganic Materials, Japan, and Journal of the Japan Society of Powder & Powder Metallurgy.

Dr. Sakka has made outstanding contributions to science and technology of ceramic processing. He has successfully developed many types of nanoparticles, such as metal, ceramic, mixed, and composite particles, by a DC-plasma method developed at NIMS. He has also developed new wet-chemical methods, such as the nano-explosion method, and a new sol-gel processing method by which several types of ceramic mono-dispersed particles have been prepared.

In the processing of ceramics by sintering, well-dispersed fine powders are desirable not only to reduce the sintering temperature but also to obtain dense and fine-grained microstructures. By employing colloidal processing, Dr. Sakka's group produced world's first superplastic alumina, which can be elongated to over 550 %. Since this achievement they have produced several types of high-strain-rate superplastic ceramics. In addition, Dr. Sakka's group succeeded in developing a new method for producing textured ceramics, in which the colloidal processing, such as by slip casting and electrophoretic deposition (EPD), is conducted under a strong magnetic field (c.a. 10 T). This method has several advantages and can be applied to many noncubic ceramics. They have fabricated many types of textured ceramics, such as α-Al_2O_3, TiO_2, ZnO, HAP, AlN, SiC, β-Si_3N_4, MAX phase ceramics, Zr(Hf)B_2, and B_4C and showed the unique dependence of their properties on the crystalline plane. β-Si_3N_4 with high thermal conductivity of approximately 180 Wm^{-1} K^{-1} and the nacre-like structured Nb_4AlC_3 with over 1000 MPa bending strength and 15 $MPa.m^{1/2}$ fracture toughness are typical examples.

Furthermore, Dr. Sakka's group developed novel sintering techniques, especially those based on the Spark Plasma Sintering (SPS). They used a combined modeling and experimental approach to clarify the relationship between the SPS parameters and the final properties. Highly transparent alumina, high-hardness B_4C, diamond particles dispersed in pure WC, and superplastic ceramics of spinel and zirconia systems are typical examples of ceramics fabricated by SPS.

So far, the number of published original papers in these research fields is above 600 and that of reviewed papers, book chapters and related articles is totally 110.

On March 11th, 2014, Mr. Yoshio Hosokawa, President of the Foundation, handed the 21st KONA Award to Dr. Sakka at the presentation ceremony held at Hosokawa Micron Corporation in Hirakata.