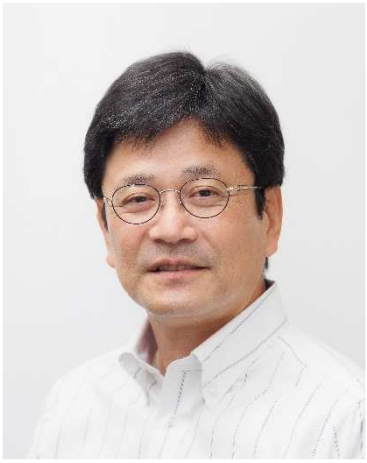

Prof. Takayuki Watanabe

Department of Chemical Engineering,
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Professor Watanabe is an expert in the area of plasma processing science. He is widely known for his work in the area of plasma modeling and applications. He has studied a wide range of applications of plasma technology including nanoparticle and nanotube syntheses, waste treatment, materials processing.

Professor Watanabe has started his career with thermal plasma modeling. He developed a non-equilibrium modeling of induction thermal plasmas without chemical equilibrium assumptions. He put forward the new concept of nanoparticle formation modeling in thermal plasmas. He has successfully clarified the formation mechanisms including binary nucleation and binary co-condensation of two components by his original mathematical. He received Plasma Materials Science Award by Japan Society for Promotion of Science, 153rd Committee on Plasma Materials Science in 2000.

The second scientific significance is nanoparticle synthesis by thermal plasmas. Functional nanoparticles of silicide and boride prepared by thermal plasmas has been applied for electromagnetic shielding, neutron shielding, and solar control windows with interaction with IR and UV light. He received Research Award by The Society of Inorganic Materials, Japan in 2005 for these achievement. He developed nanoparticle synthesis for cathode, anode, and electrolyte of lithium-ion secondary battery. These nanoparticles leads to the development of all solid-state lithium-ion battery improvement with high energy density.

The third scientific significance is waste treatment by thermal plasmas with engineering advantages such as smaller reactor, lower capital cost, portability allowing on-site destruction. He developed the water plasma system for the treatment of organic wastes. He received Microsoft Innovation Japan Award in 2007.

The fourth scientific significance is the development of innovative thermal plasma generation systems. He developed a multiphase AC arc for the application of glass melting technology. He received Plasma Materials Science Awards by Japan Society for Promotion of Sciences, 153rd Committee on Plasma Materials Science in 2014.

Finally, Professor Watanabe contributed International Symposium on Plasma Chemistry from 1987 in Tokyo. He can add to the scientific output a strong record of service. He is the Board of Directors of International Plasma Chemistry Society, and he organized 25th International Symposium on Plasma Chemistry as the Chair in 2023.