IEEE Nano Technology Council Distinguished Lecture

Creating Green Nanostructures and Nanomaterials for Advanced Energy Nanodevices

Securing safe and cheap energy and using it effectively is a serious problem for modern society. As a solution to this, we are performing research on innovative green nanodevices. We are currently developing energy generation and storage devices, low-powe devices, multifunctional nanodevices and nano-energy systems that use these devices. Manufacturing these nanodevices needs to be done precisely without damaging the nanostructures and by deriving the intrinsic characteristics of the nanomaterials and nanostructures. For the first time, such devices are made possible through the mastery of our unique intelligent nano-processes such as a super-low-damage neutral beam processes, pulsed plasma processes, and ultimate processing utilizing biotechnology.

In this lecture, we focus on bio-template and neutral beam etching fusion top-down process to realize nanoscale structures. The optical, electrical, spintronics and phononic characteristics have been already demonstrated in nanoscale structures. Our fabricated nanostructure can precisely control the transport of electron, hole, spin and phonon by diameter, height, gap and interlayer materials of the nanostructure respectively. Now, based on these results, we are trying to develop Quantum Nanostructure (QN) solar cells, QN thermo-electric conversion elements, QN Laser/LED, QN spin devices and so on.

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Prof. Samukawa joined NEC in 1981 after graduating in Instrumentation Engineering from Keio University. Worked on the research and development of ultra-precise plasma etching processes for ULSI devices. Promoted to Principal Researcher in Microelectronics Laboratory, R&D Group NEC Corporation. Obtained a Ph.D. in Instrumentation Engineering from Keio University in 1992. Since July 2000, he has been a full professor at Tohoku University, where he is currently Director of the Innovative Energy Research Center at the Institute of Fluid Science (IFS) Tohoku University. He is also a Principal Investigator (PI) at Advanced Institute of Materials Research (AIMR) Tohoku university, deputy director of Material Solutions Center (MaSC) Tohoku university, and also joint Chair Professor of Taiwan National Chiao Tung University. His significant scientific achievements earned him Ichimura Award (2008) in the New Technology Development Foundation, Prizes for Science and Technology; The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (2009), Plasma Prize in American Vacuum Society (2010) and IEEE NTC Distinguished Lecturers (2019). Additionally, he has been elected as a “Distinguished Professor” of Tohoku University, a “Fellow” of the Japan Society of Applied Physics (JSAP) since 2008, a “Fellow” of American Vacuum Society (AVS) since 2009 and also “Fellow” of Institute of Electrical and Electronics Engineers (IEEE) since 2018.

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