Prof. Seiji Samukawa Research Activity

Seiji Samukawa

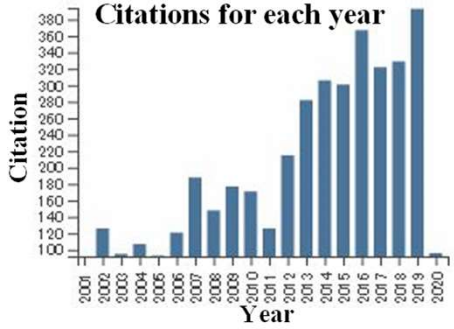
"S. Samukawa"

Professor - Institute of Fluid Science, Tohoku University

Web of Science ResearcherID
L-2719-2018

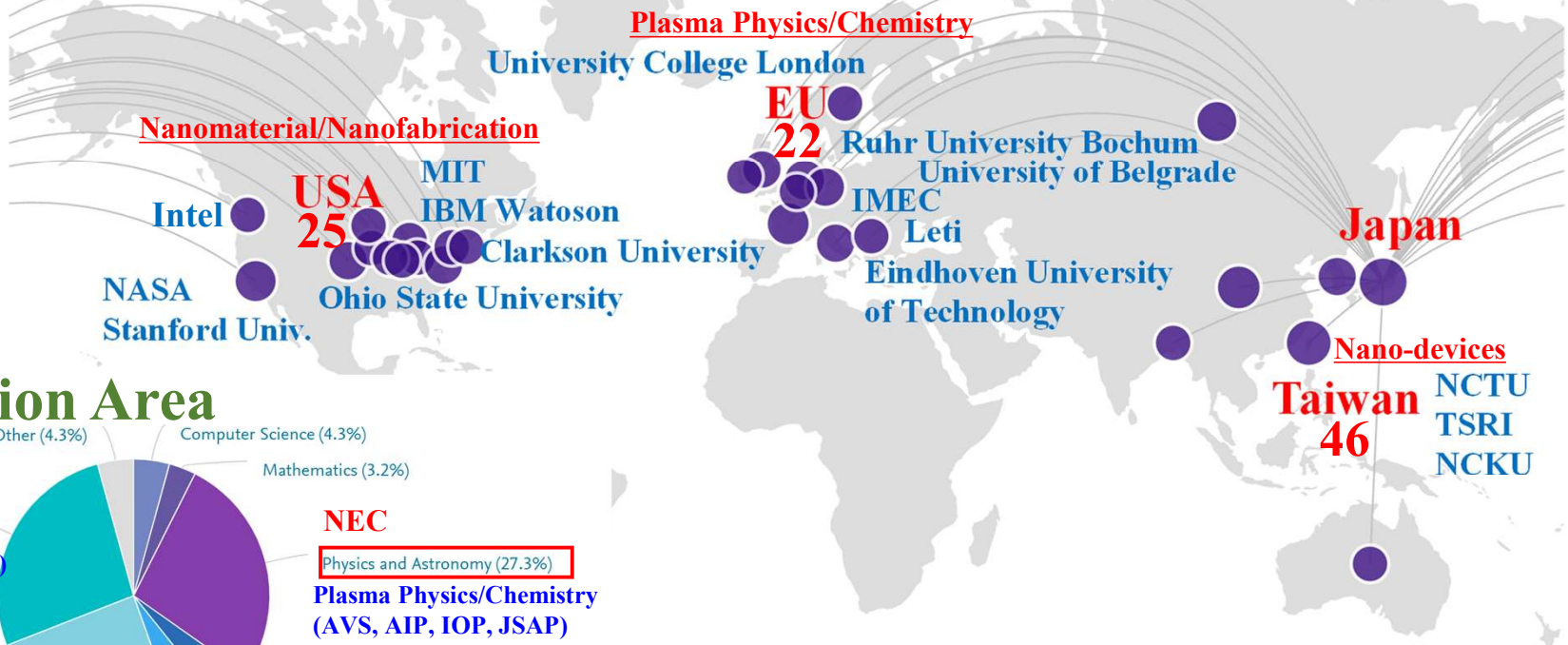
PUBLICATIONS	TOTAL TIMES CITED	H-INDEX	VERIFIED REVIEWS	International Conference
300	5054	33	5	528

(Plenary/Key/Invited Talk:132)

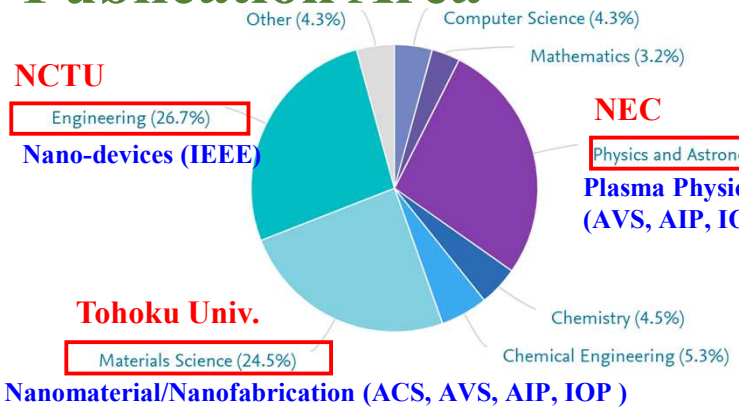


International Joint Paper:30%

Global Research Network



Publication Area



Fusion between Physics, Chemistry, Nanotechnology and Devices (Invited talks for consecutive past 31 years in various field conferences)

“Technology should be meant to be disseminated —Innovation occurs when technology flows and exchanges”

Seiji Samukawa, Tohoku University

“Technology leak” is a familiar expression in Japan, but technology is something that has to be disseminated. Being the first in the world to disseminate new technology results in exchanging information and techniques from the outside world and finally gives rise to innovation. That is, innovation occurs when people mutually and freely exchange the wisdoms they possess. My own research has progressed through the ideas that I possess and by searching for places where I can internationally brainstorm with others. This is exactly strategy for my life. I believe that innovation occurs by sharing wisdoms with people from different cultures and fields.

I began my career at a Japanese private company (the world’s top semiconductor industry). There, with the aim of developing advanced plasma etching equipment, I made my way from the downstream side to the upstream side of technology development moving from the semiconductor business division to fundamental research laboratories in Tsukuba. As part of my research activities there in a free and vigorous environment, I interacted and collaborated with fundamental plasma physics/chemistry researchers in Europe—historically known as a fundamental research center in this research field—as well as those in the United States and Japan. As a result of these efforts, I came to invent pulse-time-modulated plasma, which currently accounts for 50% of worldwide plasma etching equipment in semiconductor manufacturing. During this time, I also obtained my Ph.D. degree.

In the 1990s, Japanese semiconductor industry began to outsource a good portion of semiconductor materials and manufacturing equipment technology such as fabrication processes and lithography. This meant forsaking original and fundamental technology development in this semiconductor device field, and as a result, the technological power

of Japanese semiconductor industries unfortunately declined. This strategy led to the collapse of the Japanese semiconductor industry. I lost much of my motivation to research and develop at that time, but thinking that the research and development of manufacturing technology served as a foundation for a country, I decided to continue my fundamental research at Tohoku University, which at that time was also a hub of semiconductor and materials research in Japan. At the Institute of Fluid Science, Tohoku University, I came to invent neutral beam technology and conducted diverse research in fundamental nanotechnology technologies such as nanoprocesses, nanomaterials and nanodevices. During this time, I freely collaborated with Advanced Institute for Materials Research (AIMR) at Tohoku University and National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba and with international institutions as well centered about the United States (IBM Thomas J. Watson Research Center, NASA, etc.) where many achievements in nanotechnology were being made. I also worked with Nara Institute of Science and Technology (NAIST) in the creation of a new academic field called “bionano processes” that merges biotechnology and nanotechnology.

At Tohoku University, promoting collaborative activities with researchers from diverse fields has significantly expanded our research areas. For example, we have been actively conducting exchanges about nanodevices for about 15 years with National Chiao Tung University (NCTU) in Taiwan—the world’s No. 1 semiconductor nation—based on the nanotechnology developed at Tohoku University. The key advantage of Taiwan is its mechanism for driving innovation through the free exchange of wisdoms among industry, government, and academia in the science park. This is based on the spirit of mutual help, which is Taiwan's philosophy of life. This has made the electronics industry in Taiwan the most dynamic in the world. At the core of this mechanism is NCTU. For me, this environment made our nanodevice research activities in Taiwan inevitable, and we are promoting international industry-academia collaboration about innovated nanodevices for disseminating our technology to the world via NCTU. In fact, we established a Tohoku University/NCTU joint laboratory in 2018 to provide our researchers, who have traditionally conducted their semiconductor research individually, an opportunity to come

together through brainstorming and disseminate the technology of Tohoku University to the world.

My final objective through these efforts is to drive innovation through our technology in collaboration with NCTU and finally to “Make Japan a Leading Semiconductor Country Again!”. This is my lifework.