



New functional materials and new devices always play key roles in developing modern science and advanced technology. The Graduate School of Materials Science is now strongly promoting ‘photonic nanoscience’: by means of a broad-range photon energy covering from X-ray to microwave, novel structures, unique properties and new functionality of these new materials and devices can be elucidated at the electron, atom and molecular levels upward. We also conduct integrated engineering to understand the interaction of light with matter, to design new functional materials, and to develop new devices.

Our research output will contribute to new theory, new phenomena, new functional materials, new devices, innovative instruments, and new technologies in future. We are cooperatively educating students who are becoming excellent researchers with many talents and who are able to contribute to and lead research and development in these areas.



■ *Brilliant research accomplishments supported by an excellent environment*

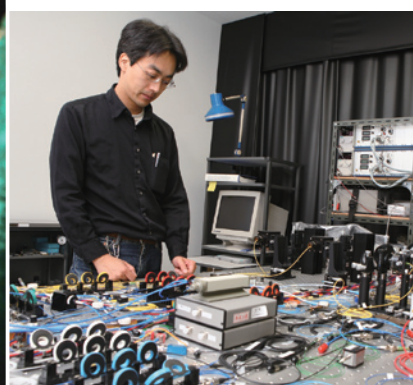
The faculty-to-student ratio in the School is extremely high. Internationally renowned and most active professors have great achievements along with many brilliant accomplishments, as evident from receiving abundant external research funds, such as Grants-in-Aid for scientific research. We can offer modern experimental facilities for all students in order to focus on research and study in a spacious environment. The School includes the Research and Education Center for Materials Science, a common education and research facility on campus to efficiently give students wholehearted support.

■ *Bidirectional industrial-academic cooperation program*

We offer fundamental courses in basic research and education in materials science, and promote collaborative laboratories to develop new materials and new devices. Students are able to have many opportunities to study practical developments. This is because researchers from external institutions including company laboratories are in charge of collaborative laboratories.

■ *Wide range of student support systems*

More than half of the students in the master’s program and all students in the doctoral program are able to reside in dormitories on campus. Scholarships and research funds are also available. We cover travel expenses for all students in the doctoral program and limited students in the master’s program to attend overseas international conferences. There are several sister school affiliations with academic institutions worldwide. Students have a great opportunity to study abroad.

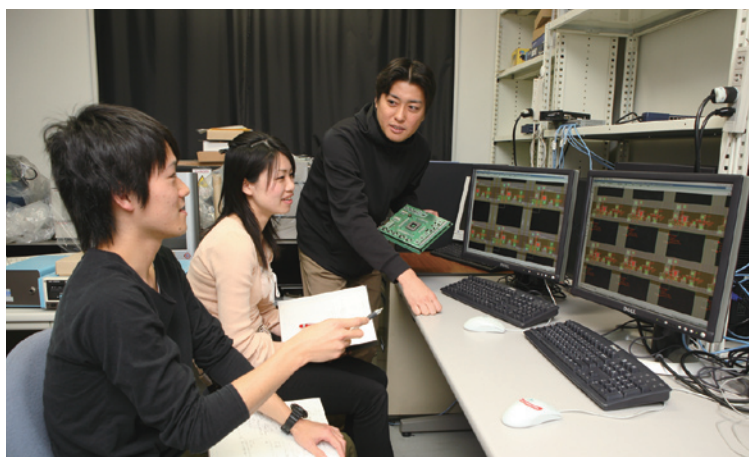


Laboratories of Materials Science

- Quantum Materials Science
- Surface and Materials Science
- Theoretical Condensed Matter Physics
- Advanced Polymer Science
- Photonic Device Science
- Information Device Science
- Microelectronic Device Science
- Synthetic Organic Chemistry
- Biomimetic Materials Science
- Bioenergetics and Biophysics
- Supramolecular Science
- Biocompatible Materials Science
- Photonic Molecular Science
- Ultrafast Photonics
- Nanostructure Magnetism
- Hamano Junichi Laboratory of Laser Bio / Nano Science

Collaborative Laboratories

- Functional Materials Science (Sanyo Electric Co., Ltd.)
- Mesoscopic Materials Science (Panasonic Corporation)
- Intelligent Materials Science (Sharp Corporation)
- Functional Polymer Science (Santen Pharmaceutical Co., Ltd.)
- Ecomaterial Science (Research Institute of Innovative Technology for the Earth)
- Sensory Materials and Devices (Shimadzu Corporation)



NAIST^{TOPICS}



Mikio KATAOKA, Professor
 Laboratory of Bioenergetics and Biophysics
 Graduate School of Materials Science

Exploring Protein Structures and Designing New Proteins

We are working on the structures, folding, functional expression mechanisms, dynamics and other properties of photoreceptors and other functional proteins, from a broad range of viewpoints, with the aim of understanding the design principles of proteins, the functional molecules fundamental to the life of organisms. The ultimate goal of our research is to understand the basics of life from the viewpoint of materials science, and my dream is to design and create artificial proteins that are useful in medical and other areas.

Proteins function by means of the donation and acceptance of protons (hydrogen). With this in mind, we demonstrated for the first time in the world that a special type of hydrogen bond known as a “low-barrier hydrogen bond” occurs in a protein, by means of high-resolution neutron protein crystallography, the best method of observing hydrogen. The finding reveals novel mechanism of photosignal transduction.

My laboratory is also responsible for promoting neutron life sciences. We are the only group in Japan engaged in protein research using neutron inelastic scattering spectrometry, which will be a major task for the Materials and Life Science Facility as part of the Japan Proton Accelerator Research Complex under construction with the sponsorship of MEXT.

Through these studies, I want to resolve the riddle of why nature selected proteins as biologically functional substances, and to reveal their essential principles by means of original ideas and independently developed technical approaches.

NAIST offers an excellent milieu for open-minded research. Discussions with researchers in other areas provide totally new insights. What I say to my incoming students every year is, “Find your own motivation for conducting research.” With the enthusiasm to make some degree of progress every day, however small, I hope that by the time they present their masters’ theses they will feel that they are no longer the same people they were when they first came to NAIST.