

— Exploring the Atomic-Scale World from Both the Experimental and Theoretical Perspectives —

➤ Research Fields

In our laboratory, we are focusing on the development of novel techniques and apparatuses such as an aberration-corrected transmission electron microscope (TEM) for atomic-scale characterization. By using our developments, we study the atomic-scale structure of surfaces and interfaces and various physical and chemical phenomena occurring at such localized areas. As targeted materials for our research, metals, ceramics, and semiconductors and also biomaterials such as DNA molecules, chemical catalytic materials and nano-sized materials are involved. We are also developing simulation technologies for designing new devices and for understanding newly discovered physical and chemical phenomena. Our research fields are divided into five categories;

- 1) Development of super-resolved electron microscopes and novel microscope techniques
- 2) Development of novel devices for atomic-scale measurement and analysis
- 3) Atomic structure analysis by aberration-corrected TEM
- 4) Studies on surface and interface properties
- 5) Analysis of physical and chemical phenomena based on computational physics

➤ Staff

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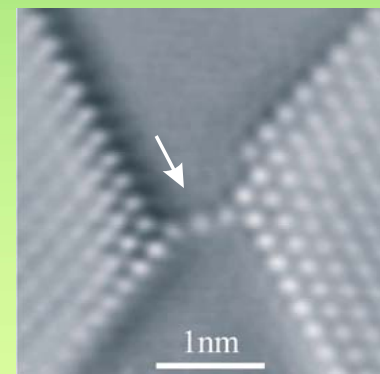
➤ One Example of our Research

“In-situ Observation of Aberration-Free Atom Image by Defocus-Image Modulation Processing Electron Microscope”

In conventional high-resolution transmission electron microscopy, atom-resolved images cannot be obtained because of residual aberrations. We developed a novel apparatus called a real-time defocus-image modulation electron microscope, which enables aberration-free observation by rapid and precise focus modulation. The electron microscope enables observation of a single-atom strand of gold wire in real-time. We are now attempting to use this novel electron microscope to observe the molecular structures of DNA and of individual atoms and molecules.



Real-Time Defocus-Image Modulation
Processing Electron Microscope



Single-Atom Strand
of Gold Wire