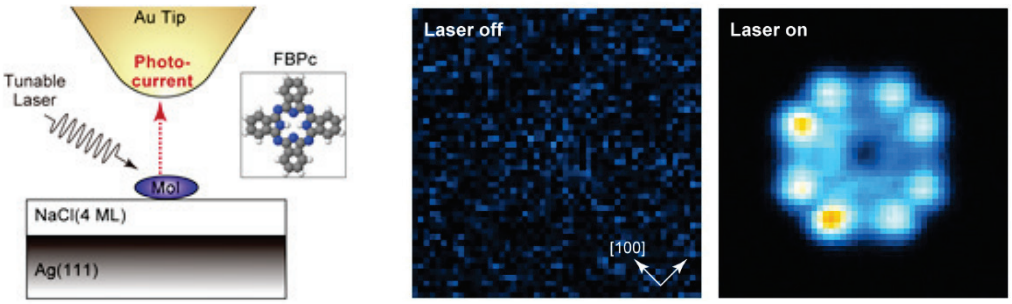
Award Achievements
The 4th Heinrich Rohrer Medal –Rising Medal–
Dr. Miyabi Imai-Imada

"For the significant achievement of the first atomic-scale visualization of photocurrent channels within a single molecule by the development of resonant fluorescence utilizing tunable laser techniques for single-molecule spectroscopy."

Dr. Miyabi Imai-Imada succeeded the first atomic-scale visualization of photocurrent channels in a single molecule, and a description of the mechanism with an ultimate precision based on the frontier molecular orbitals. Photoinduced electron transfer (PET) plays an essential role in light energy conversion processes, such as photocurrent generation, photocatalysis, and photosynthesis. The quest for an atomic-scale comprehension of PET has been a longstanding pursuit. However, the spatial resolution of conventional microscopic techniques for photocurrent measurement has previously been insufficient to resolve individual molecules, leaving the detailed mechanism obscured at the atomic scale. Dr. Imada-Imai, however, has recently achieved an advancement by enhancing the spatial resolution in photocurrent measurement by an order of magnitude higher than previous efforts. Her innovative approach combined a tunable laser with a scanning tunneling microscope (STM) to achieve the long-standing goal of visualizing photocurrent channels in a single molecule with atomic resolution. As the first author, she conceived and executed the project, with invaluable assistance from Dr. Hiroshi Imada, Prof. Yousoo Kim and her dedicated collaborators.

Dr. Imai-Imada's findings not only provide a novel strategy for enhancing the efficiency of light energy conversion in organic devices but also lay the technical foundation for unprecedented atomic-scale visualization of excited states. This breakthrough has the potential to revolutionize our fundamental understanding of functional energy conversion processes in the excited states.



(Left) A schematic illustration of the experiment and the structure of free-base phthalocyanine (FBPc). (Middle, Right) The current images of an FBPc molecule measured under the laser-off (middle) and laser-on (right) conditions.