

Visiting Professors



Visiting Professor

BABA, Yoshinobu (*from Nagoya University*)

Biomolecular Imaging by Quantum Dot

We developed the nanofluidic technology for real-time monitoring of interaction between a quantum dot (Qdot)-labeled single DNA molecule and a protein molecule during enzymatic reaction. A Qdot-labeled single DNA molecule is flowing at ca. $20 \mu\text{m s}^{-1}$ wherein the microchannel without enzyme patterning, but at the enzyme patterning region, we found a DNA molecule is stopped for several seconds to react with enzyme. We measured over 200 DNA molecules and found that a DNA molecule needs 2 second to search a cleavage sequence of DNA and 3 seconds to induced fit and cut a DNA molecule. The kinetic constant evaluated based on the single molecular measurement is consistent with the value evaluated by the conventional measurements.



Visiting Professor

AWAGA, Kunio (*from Nagoya University*)

Research on Organic Radical Materials

Organic radicals are key materials in both solid-state and solution redox processes. Organic radical solids always exhibit semiconductive behavior, due to electrostatic repulsion between unpaired electrons and/or electron-lattice interactions. This strongly suggests a potential application of organic radicals to organic electronics. We are performing fundamental research on electrical and magnetic properties of organic radical solids and application research on photo- and current-induced phenomena. We are also working on solid-state electrochemistry of insoluble self-assembled organic thin-films and transition metal complex clusters, targeting rechargeable batteries, functional electrodes, and electrochromic devices.



Visiting Associate Professor

HIGUCHI, Masayoshi (*from National Institute for Materials Science*)

Organic-Metallic Hybrid Polymers with Multi-Color Electrochromic Functions

Organic-metallic hybrid polymers are expected to have unique electrochemical, photochemical, magnetic, or catalytic properties based on strong interaction between organic modules and metal ions. Novel hybrid polymers are formed by complexation of metal ions such as Fe(II), Co(II), and Ru(II) with bis(terpyridyl)benzenes as an organic module. The polymers have specific colors based on the metal-to-ligand charge transfer and the color disappears by electrochemical oxidation of the polymer. The electrochromic properties are caused by electrochemical redox of metal ions in the polymers. We found that a film of the hybrid polymer including two different kinds of metal ions in the polymer chain shows multi-color electrochromic change at redox potentials of the metal ions. The hybrid polymers with excellent electrochromic functions will be applied to “multi-color electronic papers,” one of next generation displays.