Visiting Professors

Visiting Professor
BABA, Yoshinobu *(from Nagoya University)*

Biomolecular Imaging by Quantum Dot

We developed new materials, which are synthesized by conjugation of quantum dots (QD) and biomolecules, including DNA, enzyme, and lectin. The QD-biomolecule conjugated materials are applied to single molecule imaging of real-time interaction between DNA and enzyme, real-time imaging of single DNA molecule trafficking into a single cell, and differentiation of a single cancer cell by selective labeling of QD-lectin conjugate and imaging. These techniques are extremely useful to understand the mechanism of an enzymatic reaction at the single molecule level, to enhance the gene transfection efficiency in the gene therapy, and to develop novel technology for cancer diagnosis in the very early stage of cancer.

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

Creation of Novel Organic-Metallic Hybrid Polymers and their 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 iron(II) acetate 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. Interestingly, a single film of the hybrid polymer including both iron(II) and cobalt(II) ions shows multi-color electrochromic change: red, blue, and colorless at 0, 0.6, and 1.0 V *vs*. Ag/Ag^+, respectively. The hybrid polymers with excellent electrochromic functions will be applied to “electronic papers,” one of next generation displays.

Visiting Associate Professor
MAEDA, Hiromitsu *(from Ritsumeikan University)*

Pyrrole-Based Molecular Assemblies and Supramolecular Structures

Acyclic π-conjugated oligopyrrole derivatives, though less extensively studied so far, often potentially have even more advantages as anion receptors and metal coordination ligands than cyclic ones. This is due to the formation of versatile complexes and supramolecular assemblies, although they require conformation changes by guest binding. Of the linear oligopyrroles, oligomeric derivatives of dipyrrins bridged by π-conjugated spacers behave as building subunits and form coordination oligomers and discrete coordination nanorings. On the other hand, pyrrole oligomers with hydrogen bonding accepting site(s) have yielded unique morphologies as supramolecular assemblies and micro- and nanometer-scale structures by means of hydrogen bonding interactions. Furthermore, a new class of acyclic anion receptors, namely BF_2 complexes of dipyrrolyldiketones, have been shown to interact with anions by means of both pyrrole NH and bridging CH interactions. Ring inversion of pyrrole rings have been found to be essential to capture anions using these binding sites. Aryl-substitution of the receptors as π-extended derivatives has enabled the formation of assemblies such as supramolecular organogels that can be controlled by the addition of anions