Visiting Professors

Visiting Professor
KATO, Masako *(from Hokkaido University)*

Construction of Photofunctional Metal Complexes and the Elucidation of Their Properties

In our research group, we focus on the creation of photofunctional metal complexes.
Fabrication of new multichromic materials: Platinum(II) complexes exhibit characteristic luminescence by assembling. Taking advantage of the characteristic metallophilic interactions between Pt ions, our laboratory have developed new Pt(II) complexes with diimine or cyclometalating ligands exhibiting unique multichromic behaviors. **Fabrication of novel 3d-metal complexes with intense luminescence:** In order to effectively utilize elements, it is important that common metals should be used to fabricate materials with strong emissivity. We have developed various Cu(I) complexes exhibiting intense luminescence. **Fabrication of new photocatalysts based on redox-active organic ligands:** The strategy of our group to contribute to the energy issues is to construct novel photocatalytic systems using common metals instead of precious metals. By using a redox-active ligand, *o*-phenylenediamine, we found a simple metal-complex system for photochemical hydrogen evolution without extra photosensitizers.

Visiting Associate Professor
YORIMITSU, Hideki *(from Kyoto University)*

Synthesis of π-Conjugated Molecules by Means of Organometallics

Porphyrins are an important class of compounds that occur in nature, playing the vital roles in biologically important phenomena such as oxygen transport, oxygen storage, and photosynthesis. Additionally, they constitute useful functional molecules in the field of advanced organic material sciences including organic photovoltaics. These important functions largely rely on their highly conjugated, 18π electronic, aromatic core. Peripheral functionalizations of the core have hence been attracting considerable attentions since they effectively alter the electronic and steric natures of the parent porphyrins to create new π-rich molecules and properties. Along this line, we have been interested in the following topics. 1) Catalytic selective direct arylation of porphyrin periphery, 2) Oxidative fusions of *meso*-(diarylamino)porphyrins and the properties of nanoazagraphene products, 3) Generation and reactions of porphyrinyl Grignard reagents, 4) Synthesis and properties of porphyrin oligomers.

Visiting Associate Professor
KAMIKUKBO, Hironari *(from Nara Institute of Science and Technology)*

Excited-State Proton Transfer in Photoactive Yellow Protein

Green fluorescent protein (GFP) has been used as an effective tool in various biological fields. The large Stokes shift resulting from an excited-state proton transfer (ESPT) is the basis for the application of GFP. The chromophore of GFP is known to be involved in a hydrogen-bonding network. Previous X-ray crystallographic and FTIR studies suggest that a proton wire along the hydrogen-bonding network plays a role in the ESPT. In order to examine the relationship between the ESPT and hydrogen-bonding network within proteins, we prepared an artificial fluorescent protein using a light-sensor protein, photoactive yellow protein (PYP). Although PYP emits little fluorescence, we succeeded to reconstitute an artificial fluorescent PYP (PYP-coumarin) by substituting the pCA with its trans-lock analog 7-hydroxycoumarin. Spectroscopic studies with PYP-coumarin revealed that the chromophore takes an anionic form at neutral pH, but is protonated by lowering pH. Both the protonated and deprotonated forms of PYP-coumarin emit intense fluorescence, as compared with the native PYP. In addition, both the deprotonated and protonated forms show identical λ_{max} values in their fluorescence spectra, indicating that ESPT occurs in the artificial fluorescent protein.