Visiting Professors

Visiting Professor
OHTA, Nobuhiro *(from Hokkaido University)*

Photoirradiation Effects on Structure, Dynamics and Material Properties

Photoinduced change in electrical conductivity as well as in structure and dynamics has been examined for various materials with the time-resolved measurements of resistance and/or luminescence following photoirradiation. In the photoirradiated organic crystals, conductivity switching and bistability of current over certain ranges of applied voltages have been observed. In organic superconductors, photoinduced change in the electrical conductivity has also been examined at temperatures in the vicinity of the metal–superconductor (M–S) phase transition temperature, and unconventional asymmetry of critical slowing down about the M–S transition temperature has been found. In ionic conductor such as silver iodide, photoirradiation effect on ionic conductivity has been observed, depending on the excitation wavelength. To understand the photoirradiation effect as well as the synergy effect of photoirradiatin and applied electric field on electrical conductivity, photoirradiation effects not only on the electrical conductivity but also on the magnetic property will be examined.

Visiting Professor
ABE, Manabu *(from Hiroshima University)*

Singlet Biradical Chemistry: π-Single Bonded Species

Localized singlet biradicals have been recognized as putative intermediates in processes involving homolytic bond-cleavages and formations. To understand the homolytic reactions, the singlet biradicals should be detected at least using conventional spectroscopic analyses. To this end, we needed to design and generate relatively long-lived singlet biradicals, in which the singlet state should be the ground state spin-multiplicity. In cyclopentane-1,3-diyl systems, we have found the notable substituent effect on lowering the singlet state energetically than the triplet state. Thus, the 2,2-dialkoxycyclopentane-1,3-diyls were calculated to be the singlet ground state molecules. The 1,3-diphenyl substitution of the 1,3-biracails allowed us to detect experimentally the singlet biradical at nano-second time scale. The species was found to be observed at λ_{max} 600 nm, which is persistent below the temperature of liquid nitrogen. The electronic transition was calculated to be corresponding to the $\pi \rightarrow \pi^*$ transition, which means that the singlet species possess a character of π-single bond.

Visiting Professor
KATO, Tatsuhisa *(from Kyoto University)*

Studies of Molecular Magnetization of Super-Molecules Relating Fullerenes

People distinguish electrons in terms of Cartesian coordinates in space as well as of spin ones. Although both coordinates are independent, some spin states are specified by the electron configuration on the levels of electronic wave function in space because of anti-symmetry with exchange of electrons. In this manner the electronic structure of molecules can be characterized through the measurement of spins. The high-spin states of metallo-fullerenes and molecular complexes were investigated by high-field and pulsed electron spin resonance (ESR) spectrometers. For example, the dimetallic endohedral heterofullerene, $Gd_2@C_{79}$ N, was characterized by a half-integer spin quantum number of $S = 15/2$ by ESR measurements. The result described an exceptionally stable paramagnetic molecule with low chemical reactivity, whose unpaired electron spins were localized on the internal diatomic gadolinium cluster.