主　論　文　要　旨

2012 年　　6 月　　29 日

論文題名

Supramolecular Organization of Peripherally Modified Anion-Responsive Molecules

学位申請者　　Yuya Bando

主論文要旨

Fabrication of nano-scale organized structures based on the stacking of π-conjugated molecules exhibiting fascinating opt-electronic properties is a promising strategy for obtaining the conducting materials as liquid crystal and stimuli-responsive materials. Among the π-conjugated molecules that bind ions, boron complexes of dipyrrolyldiketones as anion receptors can be used as building subunits of the various functional materials. For example, receptors show the formation of stacking assemblies, anion-responsive dynamic structural changes (pyrrole inversion), and the construction of charge-based assemblies comprising receptor–anion complexes (planar anion) and counter cations. Preparation of functional charge-based materials requires appropriate peripherally modified receptors, resulting in the fabrication of dimension-controlled materials using electrostatic interaction.

During the course of PhD, three research subjects have mainly been investigated. (1) Anion-responsive chiroptical properties such as circularly polarized luminescence were found resulting from the control of twisted direction of inverted pyrrole rings by the introduction of chiral boron ligands and bulky pyrrole substituents to the receptors. (2) Formation of stacking assemblies and anion-responsive properties of the free receptors and receptor–anion complexes in the solid state were revealed. In particular, extension of the receptor π-moiety by aromatic-ring fusion is appropriate for the red-shifted emission and anisotropic high charge mobility in the single crystals. In this case, anion complexation followed by the introduction of aliphatic counter cations inhibits the electronic interaction between π-conjugated units such as receptor–anion complexes. (3) Fabrication of charge-based soft materials based on receptor was achieved. Assembled modes of charge-by-charge arrangements in the mesophase elucidated by synchrotron XRD analysis were found to be controlled by the geometries of the receptors.