

主 論 文 要 旨

2012 年 12 月 25 日

論文題名

Synthesis of Anion-Responsive Molecules That Form Assembled Structures

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主論文要旨

In contrast to ion-based materials comprising the species possessing localized charged sites, the construction of charge-based assemblies of positively and negatively charged species in the ordered arrangement is challenging. In particular, segregated stacking of cations and anions in the assemblies can provide electric conductive materials. One of the expected advantages of such charge-segregated assemblies is the achievement of high carrier density due to the smaller electrostatic repulsion between the identical charged species by increasing electronically identical charge carriers. As the components of charge-based assemblies planar charged species are appropriately arranged by stacking interaction. Compared to planar cations, it is challenging to prepare planar anions due to high reactivity by their excess electrons. Therefore, anion binding of electronically natural π -conjugated receptor molecules is an effective strategy to form planar anions. A promising π -conjugated receptor molecule is dipyrrolyldiketones boron complex. The modification of the anion receptor is a key issue to provide various useful assembled structures comprising charged species.

In the PhD study, two research subjects have mainly been investigated. (1) Synthesis and formation of soft materials of the π -conjugated anion receptors whose interaction sites are modified. For example, pyrrole-N- and boron-modified anion receptors formed anion-responsive supramolecular organogels. In addition, modified anion receptors provided discotic columnar mesophases consisting of dimeric disc units. (2) Fabrication of charge-based-assemblies based on modified receptors. Introduction of additional hydrogen-bonding sites and semifluoroalkyl side chains formed solvent-dependent assemblies and mesophases. Moreover, various assembled modes of charge-based assemblies were formed by a variety combination receptors (receptor-anion complexes) and cations.