Evaluation of hydrophilic conjugated polymers containing a novel benzoxaborine framework

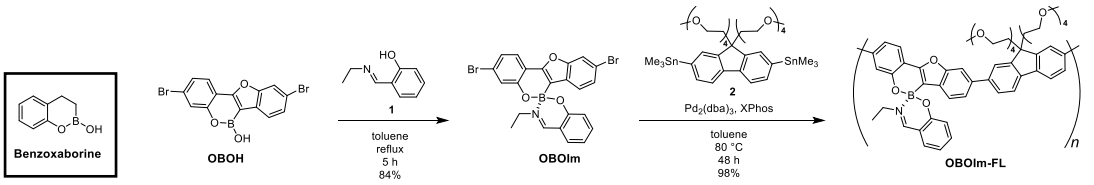
(*Graduate School of Engineering, Kyoto University*) ○Shuhei Morimoto, Masayuki Gon, Kazuo Tanaka

Keywords: Boron; Benzoxaborine; Conjugated polymer; Optical property; Hydrophilicity

Conjugated polymers have been used for wide range of applications, including organic electroluminescent devices and solar cells, because they have exhibited bright luminescence, high conductivity, and good formability. One of the methods to control the electronic properties of conjugated polymers is to introduce heteroatoms such as boron into the conjugated system.

In this study, we successfully synthesized a novel conjugated molecule **OBOH** containing a benzoxaborine, one of cyclic boronic acids. Benzoxaborine can bind compounds with some specific functional groups using a vacant p orbital and a hydroxyl group on boron.

By reacting imine ligand **1** and **OBOH**, we obtained monomer **OBOIm**. Then by copolymerizing **OBOIm** with hydrophilic fluorene **2**, we obtained a conjugated polymer **OBOIm-FL** containing the benzoxaborine framework in its main chain(Scheme 1).



Scheme 1. Synthesis of benzoxaborine derivatives **OBOH, OBOIm** and copolymer **OBOIm-FL**.

By hydrolysis of imine ligand of **OBOIm-FL** in acidic condition containing water, we found that the absolute fluorescence quantum yield of the solution improved drastically(Figure 1). This behavior is consistent with results of DFT calculation and suggests that the benzoxaborine framework in main chain can be the starting point for controlling the electronic properties of conjugated polymers. We will explain the details compared to the optical properties of the polymer without the imine ligand.

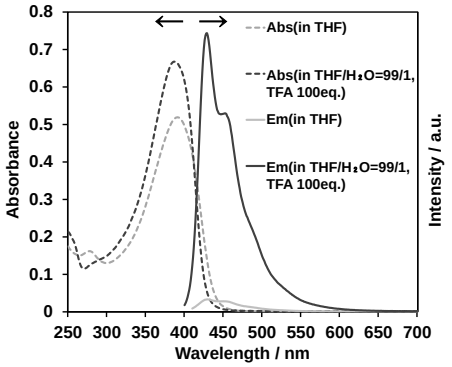


Figure 1. UV–vis absorption and photoluminescence spectra of **OBOIm-FL** in each solution (**OBOIm-FL**: 1.0×10^{-5} M per repeating unit, TFA: 100 eq. for repeating unit of **OBOIm-FL**).