Construction of Donor-Acceptor Type Conjugated Polymers Based on Pillar[5]arene Units

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Keywords: Pillar[n]arene; Donor-Acceptor Type; Conjugated Polymers; Molecular Recognition

Pillar[5]arenes are highly symmetrical macrocyclic molecules and can take up linear guest molecules because of the formation of multiple CH/π interactions between C–H moieties and electron-rich pillar[5]arene cavity (**Fig. 1a**). Besides, functional groups can be easily introduced into pillar[n]arenes. Especially, only one unit of pillar[5]arenes can be selectively functionalized. In Previous our studies, we synthesized conjugated polymers with pillar[5]arenes as building blocks by coupling reactions. However they hardly responsed to guest molecules in optical properties.[1)]

In this study, we constructed new conjugated polymers, **Bn-Polymer** and **Bt-polymer** (**Fig. 1b**). From the solvatochromism of emission bands and subsequently Lippert–Mataga plots, it was revealed that **Bn-Polymer** has two emission modes, which are derived from local excitation (LE fluorescence) and charge transfer fluorescence (CT fluorescence). These polymers showed response to guest molecules due to inclusion of the guest molecules in the pillar[5]arene cavities. In case of **Bt-Polymer**, fluorescence intensity was only increased without large peak shift upon addition of 1,2-dicyanoethane. On the other hands, **Bn-Polymer** showed mainly CT fluorescence before addition of 1,2-dicyanoethane. However, after the addition of 1,2-dicyanoethane, CT derived emission decreased and LE derived emission increased, resulting in color change upon the addition of guest molecules (**Fig. 1c**).

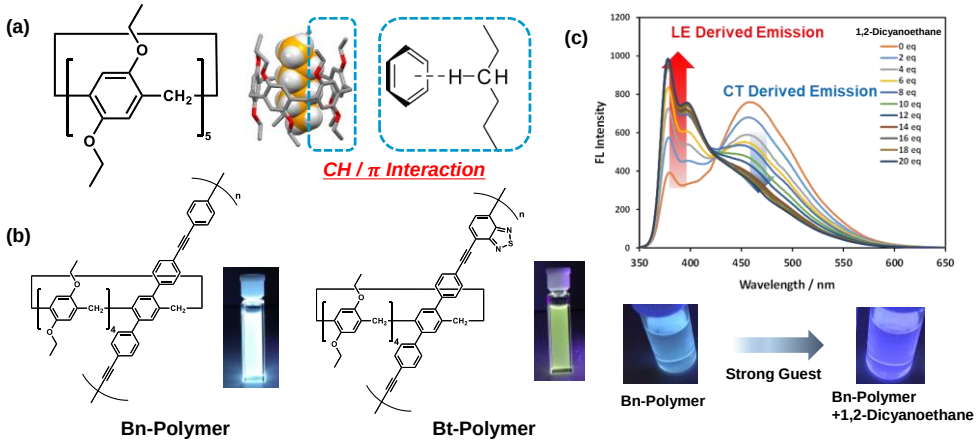

Fig. 1. (a) Chemical structures of pillar[5]arenes and their host-guest properties. (b) Chemical structures of **Bn-Polymer** and **Bt-Polymer**. (c) Fluorescence spectra of **Bn-Polymer** before (orange line) after (blue line) addition of 1,2-dicyanoethane in $CHCl_3$ (0.01 mM, λ_{ex}= 330 nm)

1) T. Ogoshi, Y. Shimada, T. Akutsu, T. Yamagishi, *Polymer,* **2017**, *128*, 325.

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