Construction and Optical Properties of π-Conjugated Molecules Based on Hypervalent Bismuth Complex

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Organic molecules have been widely used in many fields such as the development of OLEDs and OPVs. Among them, π-conjugated molecules have attracted a great deal of attention because of their high stability, electrical conductivity, and unique optical properties.

Recently, heteroatoms have been introduced into π-conjugated scaffolds for functionalization such as aiming to sensing materials. In particular, light elements such as nitrogen and boron have been used from the perspective of stability and ease of handling. On the other hand, heavy elements have not been studied much because of low stability and high toxicity. However, these elements have large electron orbitals and take flexible coordination numbers. We focused on synergy among the feature of this heavy elements and π-conjugated molecules in the purpose of sensing materials.

In this research, We focus on bismuth in the sixth period, which has variable coordination numbers. Bismuth has been used as a medicine for a long time because of its low toxicity to the human body. To investigate this element, we synthesized bismuth compounds using ONO ligands (Figure 1).

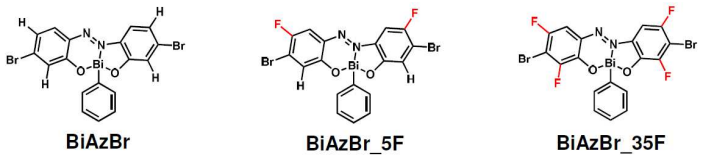

Figure 1. Bismuth compounds.

As a result of optical measurement, bismuth compounds were responded to Lewis base like DMSO. Practically, their absorption spectra were blue-shifted because DMSO was coordinated to bismuth (Figure 2). In this presentation, we discuss that Lewis acidity and optical properties of the bismuth compounds can be controlled by functional group.

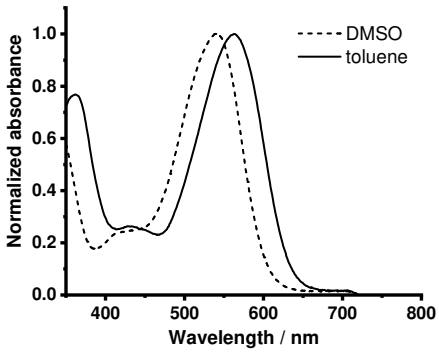

Figure 2. Absorption spectra of **BiAzBr** (solid line: in toluene, dotted line: in DMSO, 1.0×10^{-5} M in each solvent).