Synthetic and spectroscopic studies on chiral pyrene-linked cyclophane

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Recently, Circularly Polarized Light (CPL) emitting fluorophores are widely researched as promising candidates for application in next-generation display devices and biomedical researches. Especially, much effort has been devoted to organic molecules as a CPL emitter, since the design of the structure and electronic properties of organic molecules can be rationally varied to obtain emission at the desired wavelength. But the organic molecules have been pointed out the drawbacks in the CPL performances compared with those of the inorganic molecules. Therefore, in this research, we designed and synthesized a chiral pyrene dimer with an excimer emission expected structure to study CPL emission. Pyrene has been popular as the candidate of CPL devices since the 1950s, for the appropriate electronic and photophysical properties including typical excimer-emissive chromophore. In the work published in 1985, pyrene excimer[1] was recognized as CPL emitting chromophore. Compared to other CPL emitting organic molecules reported until today, the dissymmetry factor g_{lum} for pyrene excimer was considerably high, around 0.01, where dissymmetry factor can have the value between $-2 \leq g_{lum} \leq +2$. Even though the research on CPL from pyrene excimer was firstly reported a few decades ago, we are still not clear about why the CPL performance for the pyrene excimer was higher than from other organic molecules.[2]

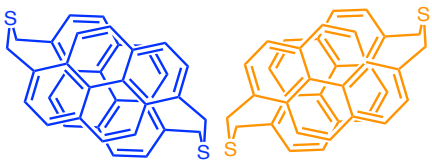

Fig1. 3,7-dithia-1,5(1,6)-dipyrenacyclooctaphane

In this research, 3,7-dithia-1,5(1,6)-dipyrenacyclo-octaphane (Fig.1) was synthesized and characterized the spectroscopic behavior to understand the relationship between the excimer state and CPL. This cyclophane-type structure generates a chiral structure and the two enantiomers were separated using a Chiral HPLC. The CD and UV-spectra of the enantio-pair of the compound are shown in Fig. 2. The details of the spectroscopic data will be discussed.

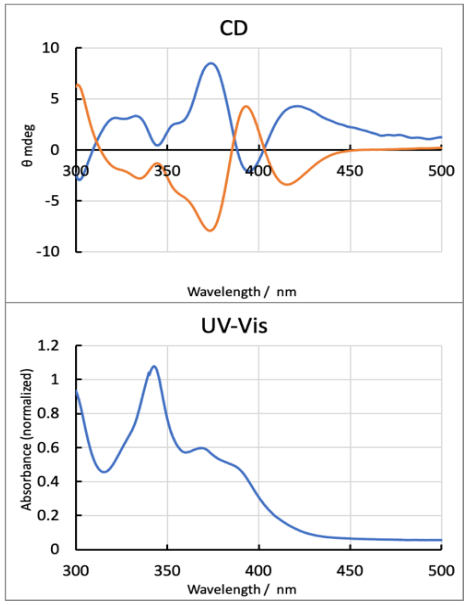

Fig2. CD and UV-Vis spectra of 3,7-dithia-1,5(1,6)-dipyrenacyclooctaphane

1) K. Kano *et al.*, *J. Am. Chem. Soc.*, **1985**, *107*, 6117.
2) S. Moya *et al.*, *Chem. Eur. J*, **2015**, *21*, 13488.