

Circularly Polarized Luminescence of Partially Overlapped Carbazolophane Derivatives

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Carbazole is a popular fluorescent heterocyclic aromatic amine and one of the famous polymer containing carbazole chromophore is poly(*N*-vinylcarbazole), which is well known as organic hole-transporting materials. To investigate the structure and photophysical properties of the excimer formed in poly(*N*-vinylcarbazole), our group has synthesized both partially overlapped and fully overlapped carbazolophanes.

As shown in Figure 1, two carbazole rings in partially overlapped carbazolophanes are helically stacked. They possess a C₂-symmetry axis and thus they are planar chiral. Optical resolution has been carried out by preparative chiral HPLC employing a Daicel Chiralpak ID column. The CD spectra of two separated fractions are mirror-imaged in shape and identical in absolute intensity.

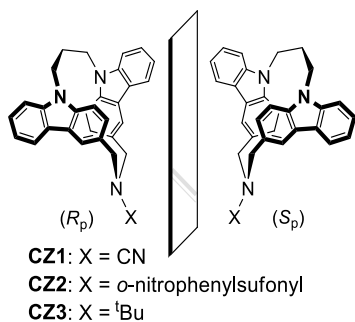


Figure 1. Planar chiral partially overlapped carbazolophane derivatives **CZ1–CZ3**.

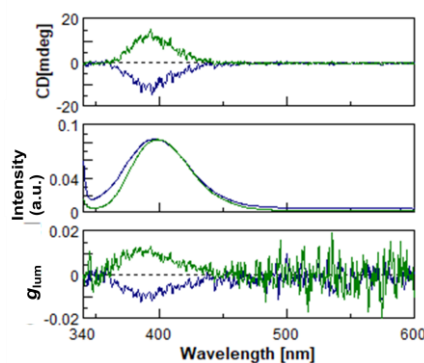


Figure 2. CPL (top), Emission (middle), and g_{lum} (bottom) spectra of **CZ1** in benzene. Blue and green colors correspond to *S_p* and *R_p*, respectively.

The determination of the absolute configuration of enantiomers was based on the comparison of experimental and theoretical CD spectra, and measurements of X-ray crystal analysis of enantiomerically pure **CZ2**. Figure 2 shows the CPL spectra of (*R_p*)- and (*S_p*) of **CZ1**, which are shown in green and blue line, respectively. Although the fluorescence quantum yield of **CZ1** was low, luminescence dissymmetry factor g_{lum} is 0.013.¹ This value is comparatively large as a small organic compound.

To examine the correlation between molecular structure and g_{lum} , *tert*-butyl amine bridged [3.*n*](3,9)carbazolophane derivatives such as **CZ3** will be prepared, and their photophysical and chiroptical properties will be discussed.

1) K. Tani, R. Imafuku, K. Miyanaga, M. E. Masaki, H. Kato, K. Hori, K. Kubuno, M. Taneda, T. Harada, K. Goto, F. Tani, and T. Mori, *J. Phys. Chem.A*, **2020**, *124*, 2057.