

Circularly Polarized Luminescence of DAAD type Fluorophore in Chiral Nematic Liquid Crystal and Effect of Alignment

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Small organic luminescence molecules have been attracted much attention because of their flexible chemical structure and adjustable optical performance. Plenty of excellent small organic molecules have been investigated especially as chiral luminescence that exhibit circularly polarized luminescence (CPL) properties. Some remarkable progresses have been achieved, but several challenges remain since these reported materials showed small dissymmetry factor (glum) in the range of 10^{-5} to 10^{-2} which are still challenging for further enhancement. Similar results were observed in our previous compounds addressing Donor-Acceptor-Acceptor-Donor (DAAD) structures where carbazole and naphthalimide derivatives were used as donor and acceptor respectively^{1,2}. To enhance the dissymmetry factor, various strategies have been reported.

Chiral liquid crystal phases have raised increasing interest owing to their chiroptical properties and helical structures. Introducing chiral dopant to a nematic liquid crystal for chirality transfer is a well-known technique to improve the CPL properties; recently additional doping of a chiral nematic liquid crystal by RGB achiral polymers even gave access to photo switchable white CPL with high glum values³. Here, we aim to enhance the glum values of our DAAD compounds by using it as dopants in nematic liquid crystal matrices. Furthermore, we are also examining the effect of surface treatments of our liquid crystal analytic cells, analyzing the chiral nematic liquid crystal behavior after deposition on homogeneous and homeotropic alignments. This resulted in a gradually improved glum value from 10^{-3} to 10^{-1} . This enhancement of the glum value is promising for a large range of applications such as displays, sensors or security tags.

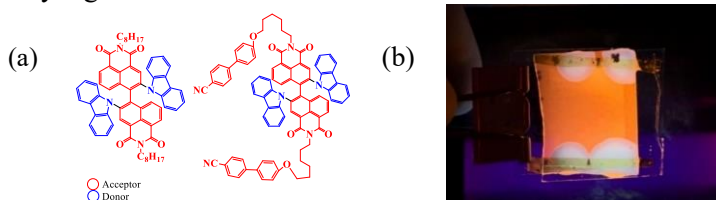


Figure: (a) Chiral Compounds in this research, (b) CPL-active material under UV light

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