Mechanism of Chirality Induction in Photoresponsive Chiral Nematic Liquid Crystals

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We synthesized cyclic chiral compounds by linking a photoresponsive bisbenzothienylethene (BTE) moiety with an axially chiral binaphthyl moiety. The chiral nematic liquid crystals (N*-LCs), prepared by adding the chiral compounds as chiral dopants to host N-LCs, exhibited a reversible chirality inversion in photoisomerization between open and closed forms of the BTE moiety[1]. Herein, the mechanism of chirality inversion in photoresponsive N*-LCs was examined by comparing the helical twisting powers (HTPs) with those of the analogous compounds (**Figure 1**). It was found that the HTPs of these chiral compounds (*R*)-D2s to the host N-LCs are determined by the sum of the right-handed helical sense values of the binaphthyl moiety and the left-handed helical sense values of the BTE moiety. In the chiral dopants with diarylethene (DE) moiety reported previously, the DE moiety is racemic and only the axially chiral binaphthyl moiety induces a helical structure in the host N-LCs[2]. In contrast to the previous chiral compounds, the present (*R*)-D2s have induced chirality of the BTE moiety that is intramolecularly linked with the axially chiral binaphthyl moiety.

In conclusion, we clarified the mechanism of chirality induction occurring in the cyclic chiral compounds including the binaphthyl and BTE moieties through systematic syntheses of various chiral analogues.

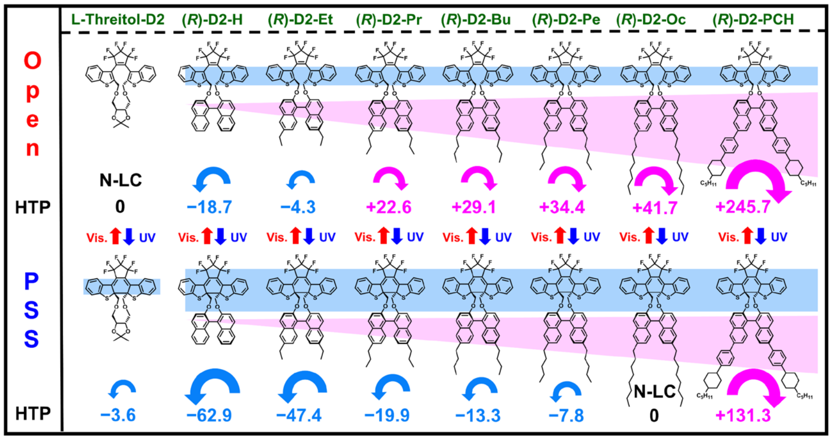

Figure 1. Helical sense and helical twisting powers of the chiral compounds in open and closed states.

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