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Dipartimento di Tecnologie Chimiche

Seminario

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Titolo:

"Chirality of Polymers in Excited States"

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Chirality of Polymers in Excited States

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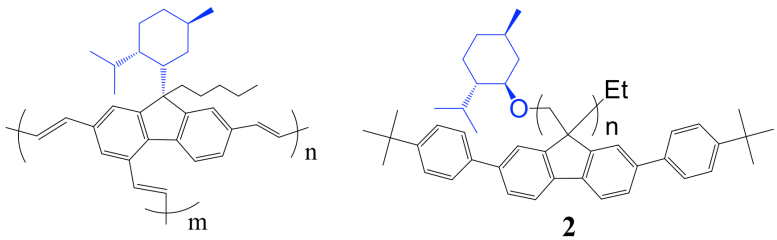
Keywords: circularly polarized light (CPL); helix; polyfluorene; circular dichroism; fluorescence; optical activity

Abstract: CPL-emitting Chiral Polymers Fluorescent and phosphorescent organic polymers are an important class of materials for organic light-emitting diodes (OLEDs) based on their advantages that emission properties can be modified through molecular designs, that they are inherently light and flexible, and that they can be readily fabricated by solution processes.[1] Among various polymers of this class, those emitting circularly polarized light (CPL) are of particular interest because of their potential for photonic devices such as 3D displays and energy-efficient backlights for LC displays. We have synthesized two types of CPL-emitting chiral polymers, i.e., a hyperbranched fluorenevinylene polymer (**1**) [2] and poly[2,7-bis(4-t-butylphenyl)dibenzofulvene] (**2**) [3]. **1** and **2** emits green CPL and white CPL, respectively. It should be noted that **1** emits CPL at a high efficiency (anisotropy) in an amorphous film without any detectable inter-chain alignment. **1** may take a highly anisotropic structure in excited states that largely differs from the chiral structure in the ground state.



1 **2**

Photo-driven Synthesis of Polymer Helix

A preferred-handed helical conformation was reversibly induced to poly(9,9-dioctylfluoren-2,7-diyl) (**PDOF**) in a thin film form upon irradiation by single-handed circularly polarized light [4]. The induction mechanism is proposed to be based on a photo resolution process including a predominant excitation of right- or left-handed twist conformation in the ground state into an achiral coplanar form in excited states (**Figure 1**). The coplanar form is deactivated into right- and left-handed forms, resulting in enrichment of one twist form with less likelihood of excitation by the single-handed CPL than the antipode. Deactivation may tend to form a twist of which handedness is the same as single-handed twists in the vicinity that have been formed previously in earlier excitation–deactivation events. This effect should be more obvious when the difference in the populations of P- and M-twists is larger, bringing about an apparent amplification. This is the first example of helix chirality induction to a main-chain conjugated polymer using CPL.

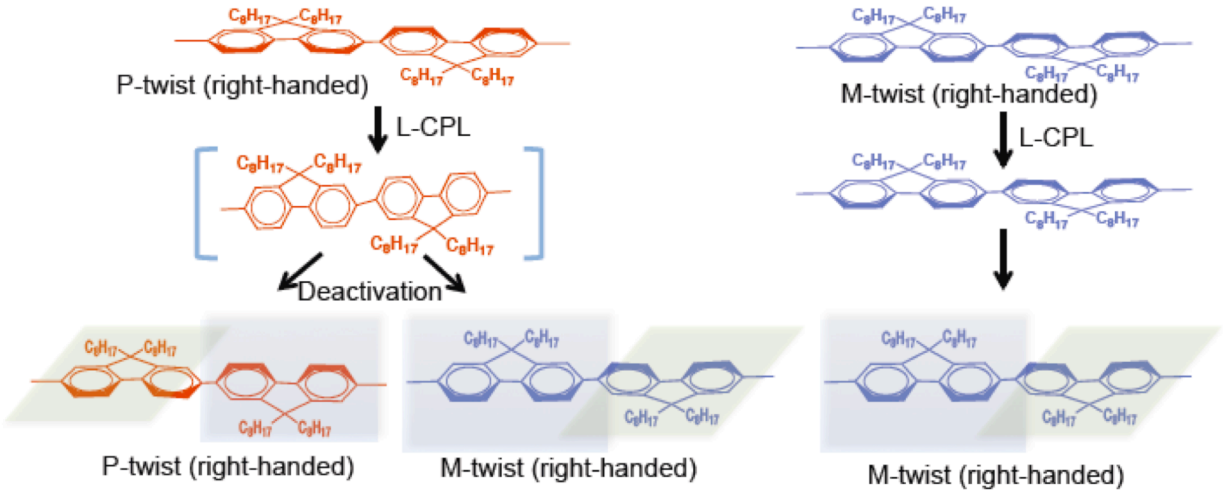


Fig. 1 A proposed mechanism of helix induction to PDOF by CPL.

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