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Exploring the role of supramolecular chirality in the optoelectronic properties and photoconductivity of hydrogen-bonded diketopyrrolopyrrole derivatives

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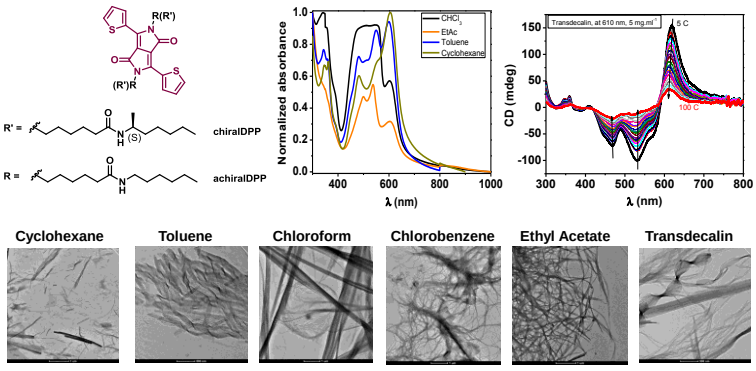
Hydrogen bonds can efficiently guide the self-assembly processes in organic semiconductors and enhance their properties.[1,2] Several parameters such as temperature, concentration and solvent can be used to modify the aggregation state while tuning the optoelectronic properties at the same time.[3] Chirality can be included within the influencing parameters due to the differences in molecular packing when chiral centres are present. Very interesting electronic and spintronic properties can be achieved with the presence of chiral centres, opening up great alternatives to use these molecules as energy harvesting materials. Here we show chiral and achiral thiophene-capped diketopyrrolopyrrole derivatives containing hydrogen-bonding motifs (Fig. 1). The difference in aggregation state, due to the introduction of chiral groups next to the hydrogen-bonding moieties, results in great differences in their optical properties (Fig. 1) and photoconductivity. Strong J-type aggregates were observed in the spectra of the chiral derivative together with intense circular dichroism signals at the aggregates wavelength.

These results together with the different types of helical morphologies found are correlated to their different optoelectronic properties and photoconductivity measured by electrodeless techniques, such as flash photolysis time resolved microwave conductivity (FP-TRMC).



Références

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