

EXPLORING HYDROGEN-BONDING AND SUPRAMOLECULAR CHIRALITY IN ORGANIC ELECTRONICS

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ABSTRACT:

The presence of noncovalent interactions in organic semiconductors has been demonstrated to be beneficial in several applications, resulting in the enhancement of charge transport and device efficiency. Particularly, the incorporation of H-bonds in organic semiconductors has been proven to increase solar cell efficiency by 50%.¹ Nevertheless, the race for achieving efficiency records, has hampered research focused on solving other fundamental issues. Regarding hydrogen-bonding, no comparative studies have been performed, finding scattered examples in literature with different semiconductors, H-bonding units and without complete studies including both, the optoelectronic and self-assembly properties.² The main goal of our research is to understand the impact of hydrogen bonds in supramolecular electronics to apply them efficiently in devices. Here we show a comparative study using diketopyrrolopyrrole (DPP) as a model system³ (Figure 1) and how the results are translated into state-of-the-art materials, such as quinquethiophene-rhodanine and isoindigo derivatives (Figure 1). Different families of hydrogen-bonded DPP supramolecular polymers displaying different hydrogen-bonding parameters will be discussed,³ including the role of chirality⁴ in the final electronic properties.

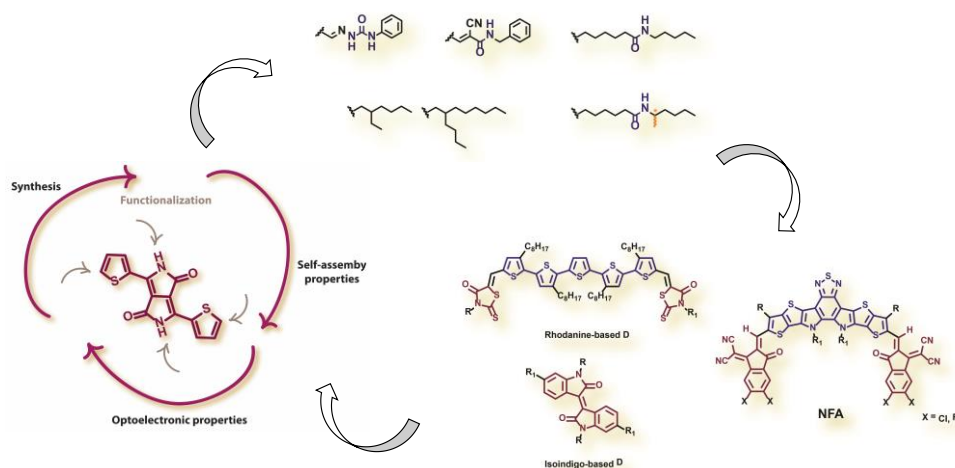


Figure 1 : Model system for the study of hydrogen-bonding in organic electronics, followed by the parameters to be explored and the expansion to state-of-the-art semiconductors

References

- 1- Aytun T. Chem. Mater. 2015, 27, 1201
- 2- Ghosh T. Polymers, 2017, 9, 112
- 3- Millitzer S. Chem. Eur. J. 2020, 26, 9998
- 4- Gacia A. Chem. Commun. 2022, 58, 529