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Functionalization of the Benzothioxanthene core: Scope and limitations

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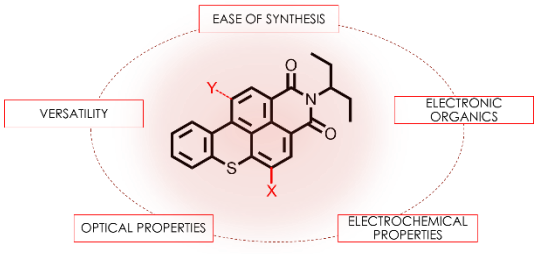
Organic electronics, pipe-dream few decades ago, is now a reality with commercially available Organic light emitting diode based displays (TVs, smartphones), organic based electrochromic devices, organic batteries or organic photovoltaics. Hence, the advent of such research field has generated a craze in the scientific community leading to the synthesis and characterization of various classes of π-conjugated molecular and macromolecular semiconductors. Among them, imide-containing rylenes have attracted considerable research attention due to their redox, electron-withdrawing and charge-carrier transport properties, as well as their excellent chemical, thermal, and photochemical stabilities.

Naphthalene diimide (NDI) and perylene diimide (PDI) can be unequivocally recognized as the most studied imide based building blocks for the preparation of high-performance electron transporting optoelectronic materials. Within these wide-ranging studies, considerable effort has been undertaken to functionalize both the bay positions and the nitrogen atom constituting the imide group (N-positions) to bring solubility, tune the molecular (opto)electronic characteristics, and build extended π-conjugated architectures.

A contrario, the N-(alkyl)benzothioxanthene-3,4-dicarboximide (BTXI), a sulfur containing rylene-imide dye, has not triggered such research interest. Among the very scarce publications, the later was exclusively used in bioimaging due to its remarkable fluorescent properties (fluorescence quantum yield of ca 90 % in chloroform solution and 50% in powder). Moreover, from a chemical point of view, the BTXI was solely functionalized on the N-position for post-grafting purpose and/or to increase solubility resulting, once again due to a lack of interest, in limited range of characterizations and applications.



Daring challenge, we have recently initiated a fundamental work to i) fully characterize this unrecognized bloc, ii) functionalize its core at different and specific locations iii) build new π-conjugated functional molecules and iv) evaluate their potential for energy conversion and storage applications.

Références

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