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Organic Chromophores with Twisted Geometry as Amorphous Materials for Photo-Electronic Devices

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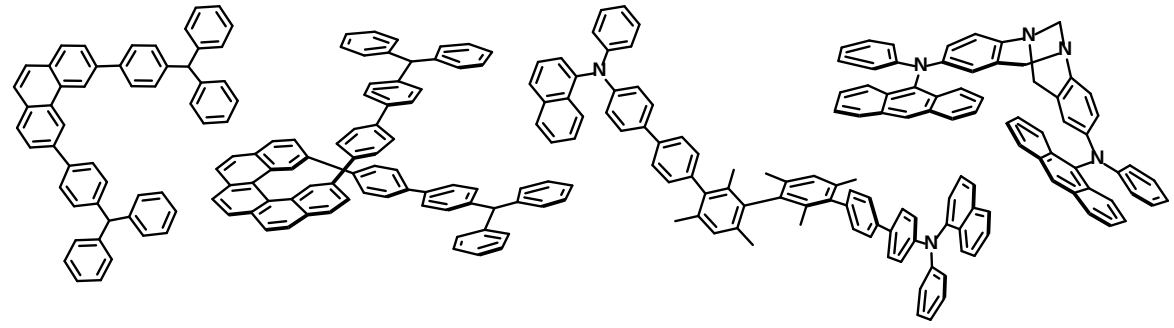
Recent development of organic photo-electronic devices has promoted the works of designing new types of organic materials that display high efficiencies in both light-emission and charge-transportation. In these devices the organic materials are processed into solid thin films either by spin-coating or by vapor-deposition methods. However, in the solid state small organic molecules tend to crystallize, which usually induces self-quenching that diminishes luminescence. To reduce the tendency of crystallization, longer side arms with a flexible conformation are introduced. In addition, it is equally important to maintain a smooth movement of charges that pass through the films, therefore a good overlap of π-conjugation between adjacent molecules is required. With these considerations, we designed and synthesized several groups of organic compounds, and applied them successfully to the fabrication of organic light-emitting diodes (OLEDs) and perovskite solar cells. These compounds contain a core structure with 2-4 side arms extending outward from the center. Their spherical shapes are helpful for the formation of amorphous films with close packing in the solid state. By adjusting the functionalities of the side arms, these compounds can exhibit various properties such as light-emission and charge transportation. The devices fabricated with these materials displayed remarkable quantum efficiency. In this report, the synthesis of these compounds and their performance are describes.



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