New Dyes for Optoelectronics

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Borondifluoride complexes of 1,7-bis(aryl)-1,6-heptadiene-3,5-dione derivatives or curcuminoids are donor-acceptor-donor (D-A-D) dyes which show great promise in organic electronics. An appropriate functionalization of their phenyl groups leads to near infrared fluorescence emission in solution and in the solid state.[1,2] We prepared BF_2-curcuminoids with a large series of aromatic donor cycles, allowing efficient modulation of optical and electronical properties in solution.[3,4] These molecules have also been studied in the solid state (nanoparticules, single crystals, thin films) and high values of near-infrared fluorescence quantum yields were obtained.[5].

The advantage of these materials lies in their simple synthesis and low cost. When used as a donor material in combination with $PC_{61}BM$ in solution-processed bulk heterojunction organic solar cells they showed a remarkable photovoltaic performance considering the simplicity of the synthesis. The open circuit voltage over 1.0 V was achieved with moderated photovoltaic yield of 4 %.[6]

Device properties were shown to depend on chromophore aggregation. In order to understand the properties of this class of materials in the solid state we synthetized a series of curcuminoid dimers covalently linked by a flexible chain. The results are discussed in the light of the data obtained for the D-A-D dyes in the solid state.[7]

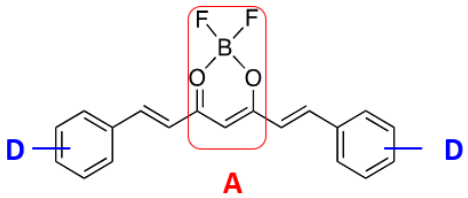

Fig. 1 Chemical structure of the curcuminoid-BF_2 dyes featuring lateral electron donor (D) groups and the electron acceptor (A) dioxaborinine unit.

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