VERSATILE BENZOTHIOPHENE DERIVATIVES: SYNTHESIS, OPTOELECTRONIC PROPERTIES, AND APPLICATION IN SOLUTION-PROCESSED OLEDs

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In recent years, organic light-emitting diodes (OLEDs) have emerged as key players, attracting attention for their efficiency, diverse applications to commercial electronics including television displays, phones, and computers in daily life. Over the past decade, substantial efforts have been devoted to enhancing OLED technology, addressing luminance efficiency, color range, device stability, and fabrication techniques. [1] Within the field of organic emitters, sulfones have shown great interest. [2] Notably, benzothiophene S,S-dioxide, have garnered significant interest as a good building block for emissive material synthesis. Its adaptability to various functionalization methods, from coupling reactions to cycloaddition and photodimerization, including transformation into Benzo[b]thiophen-3(2H)-one 1,1-dioxide that can be further functionalized, underscores its versatility.

This communication illustrates the synthesis of benzothiophene and its oxidized form from thiophene through oxidation and cycloaddition reaction. Then from benzothiophenes, easy access to two distinct families. One family is obtained through conventional C-C coupling reactions between triphenylamines and brominated benzothiophenes S,S-dioxide, resulting in a series of molecules that exhibit diverse colors including blue, green, and orange, with substantial luminance. The second family is obtained through Michael's addition-elimination reaction followed by annellation using palladium-catalyzed intramolecular C-H/C-H to produce a set of fused compounds with dual-state emission, yielding between 70-90%

In this communication, the optoelectronic properties of these benzothiophene derivatives and their application in solution-processed, air-spin-coated OLEDs with a turn voltage of 3.5V and luminance up to 1200 cd/m^2 will be discussed. To address scalability and minimize product waste, slot-die coating techniques employing green solvents are explored for large-area printed OLEDs, accompanied by a discussion on the challenges encountered during the printing process.

References

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