

SYNTHESIS and PROPERTIES of THIENOTHIOPHENE-BORON FOR OLED APPLICATION

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ABSTRACT

Donor-acceptor (pulling and pushing interaction) type molecule was synthesized which contains dimesityborane unit as acceptor, TPA unit electron donating group and -CN derivative of thieno[3,2-*b*]thiophene unit as π bridges were synthesized. Electrochemical and photo properties were investigated with experimentally.

INTRODUCTION

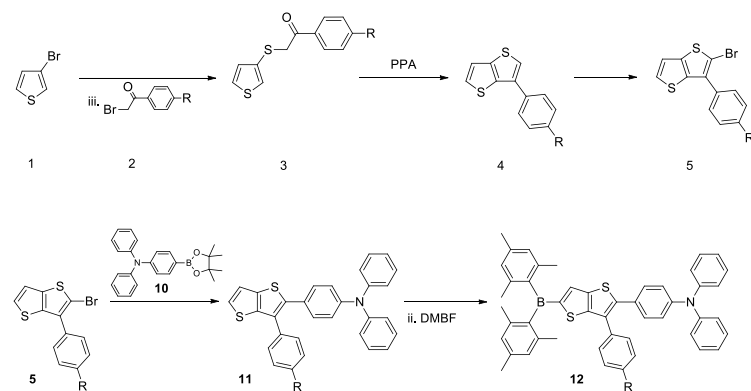
Organic electronic materials, both small molecules and conjugated polymers, have been the focus of an increasing attention of academic and industrial research, particularly in chemistry and physics. This is due to their possible applications in electronics and optoelectronics such as organic light-emitting diodes (OLED), field-effect transistors (FET), lasers, photodiodes, and solar cells. Organic light emitting diodes (OLEDs) are an important innovation in display technology. This technology provides improved image quality, high brightness, low power consumption and high durability [1]. Also, with their ultra-thin structure and low production

Thienothiophene (TT) molecules with long π conjugation and planar structures have many applications in material chemistry. Because of the nonbonding electrons on sulfur atom of thiophene ring, TT structures are in donor characteristic. Thus, they can be used in conjugate systems. In this study, we aimed to synthesize and investigate the optical properties of D- π -bridge-A systems as promising OLED materials. For this purpose, molecules **11** was synthesized. Then, the structures **12** possessing mesitylborane units as acceptors (A) and triphenylamine (TPA) groups as donors (D), have been synthesized and demonstrated extremely high quantum yields. The characterization of these molecules showed us that they both are promising OLED structures.

costs, OLEDs promise great developments in display market. Their operation is based on the phenomenon called electroluminescence, which is the conversion of electrical energy into light [3].

In the last few years, with the recent developments in technology, the applications of organic molecules in OLEDs, biosensors, capacitors, electrochromic devices and organic photovoltaics became very important. Different functional groups on molecules provide different absorption, emission or capacitor characteristics and determine their usage areas.

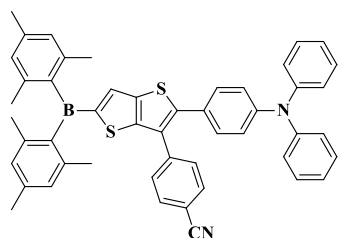
EXPERIMENTAL



R= -CN

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RESULTS and DISCUSSION



Emissions of molecule **12** under UV light and quantum yield values are very good, thus making them appropriate OLED molecules. In the UV-Vis spectra of molecules it is observed that the peak tails reach upto 450 nm in liquid state and approximately 500 nm in solid state. Also cyclic voltammetry measurements of molecule have been studied and the electrochemical band gap was

calculated by using oxidation and reduction potentials. In these measurements, a Pt wire was used as working and counter electrodes. As a reference electrode a Ag wire was used. A 0.1 M TBAPF₆ and 10⁻³ M monomer consisting of ACN/DCM solvent mixture were prepared as the electrolyte. In cyclic voltammograms, it is noticed that there are two oxidation potentials. According to the literature, the first one belongs to TPA molecule.

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