



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : P. Gopikrishna

Roll Number : 126153008

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Thesis Title: Design and Synthesis of Novel Conjugated Organic Semiconducting Materials for Organic Light Emitting Diodes

Name of Thesis Supervisor(s) : Prof. Parameswar K. Iyer

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**SHORT ABSTRACT**

Highly efficient materials (monomers & polymers) are developed as emissive layer for organic light emitting diode by utilizing the donor-acceptor monomers and AIE active compounds. The 1,8-naphthalimide is inserted as acceptor into the donor polyfluorene and polycarbazole main chain. The well charge balanced or efficient materials are established by varying the feed ratios of acceptor mol % in the donor polymers. Moreover, the emission colors of the copolymers are tuned from blue to green and blue to red in case of polyfluorene and polycarbazole, respectively. The PLEDs are fabricated with these new materials that exhibited excellent device properties. The AIEE active monomers are synthesized based on the mono-substituted dibenzofulvene (M-DBF) derivatives and their photophysical properties are further investigated. White light emitting polymers are synthesized by incorporating AIEE active monomers as orange or red emitting dopants into polyfluorene host. The newly developed materials showed high solubility, which is very important parameter to obtain better film forming properties during the device fabrication. In addition, to the incorporation of the AIEE active monomers into the polymer host, the voltage independent EL spectra is easily achieved. This can be attributed to the non-planarity of the AIEE active molecules which can effectively reduce the intermolecular interactions in the condense state. Another set of AIEE active monomers are synthesized based donor and acceptor units by changing the bridge (Thiophene & Phenyl) between donor and acceptor. The thiophene substituted monomers displayed the AIEE active nature and remaining phenyl substituted monomers exhibited weak or AIE inactive nature. Also, the heavy atom effect is successfully studied. The detailed theoretical studies are performed to support the experimental results. Overall new organic materials with improved optical properties are developed and utilized for OLED applications as well as AIE properties.