Abstract

Organic electronics, an emerging branch of science uses conjugated organic molecules as functional components in electronic devices. The recent research advancements in this field lead to several electronic devices like organic field effect transistor (OFETs) and organic light emitting diodes (OLEDs). There were significant efforts to improve the performance of devices based on organic molecules. This challenge generates the demand for innovative novel organic materials having semiconducting properties. On this background, this thesis deals with the synthesis, characterization of Tetraphenylethene (TPE) based novel discotic liquid crystal materials and to study their organic light emitting diode (OLED) device performance of aggregation-induced emission (AIE) active material exhibiting columnar assembly.

The first chapter of the thesis deals with the introduction and types of liquid crystals. Primarily, the discotic liquid crystals have been discussed in detail.

The second chapter of the thesis deals with a brief introduction to organic electronics, organic semiconductors, and organic light-emitting diodes.

The third chapter of the thesis deals with a brief introduction to the instruments and characterization methods of discotic liquid crystals. The working principle of the techniques has been illustrated with the modeling of the instruments.

The fourth chapter of the thesis deals with the synthesis and characterization of tetraphenylethene derivatives. The details of the experimental procedures have been added, and the final compound's spectral, thermal, photophysical, electrochemical behavior has been analyzed, and theoretical studies have been done using density functional theory. The device performance of the final materials as emitters in the organic light-emitting diode also investigated.

The final part of the thesis consists of the conclusions, future outlook and appendices.