Abstract

Thiophene-based fused conjugated materials are highly valuable in the field of organic electronics due to their exclusive features including electron-rich nature of thiophene, extending conjugated structures, and tunable properties. These properties make them a versatile choice for applications like organic solar cells, organic field effect transistors and organic light emitting diodes etc. These conjugated materials displayed efficient charge transport carriers, mechanical flexibility and cost effectiveness. In this research work, thiophene based conjugated materials are designed and synthesized including Thieno[3,4-b]pyrazine, 7-Bromo-5H-thienopyrazine[2,3-b]indole, 6-bis(5-bromothiophen-2-yl)-2,5-bis(2-ethyl hexyl)pyrrolo[3,4-c]pyrrole-1,4(2H,5H)-dione, and 6-bis(5-bromothiophen-2-yl)-2,5-bis(2-octyldodecyl)pyrrolo[3,4-c]pyrrole-1,4(2H,5H)-dione. The electronic properties of these synthesized materials are analyzed using UV-Vis spectroscopy and photoluminescence spectroscopy. Besides that, various characterization techniques are employed to confirm the synthesis of desired materials including GC-MS, FT-IR and NMR spectroscopy. Their exceptional light-absorbing properties make them ideal candidates for photovoltaic cells, enabling more efficient conversion of sunlight into electricity, thus contributing to the development of sustainable energy solutions.