ABSTRACT

The continuous increase in worldwide energy consumption forces researchers to find new methods and techniques for sustainable and eco-friendly energy sources. This work presents a comprehensive study on the synthesis and characterization of fused ring quinoxalines, a class of organic compounds with promising potential in energy conservation applications. The research begins with the synthesis of fused ring quinoxalines from small monomers. I have used *"3,6-dibromobenzene-1,2-diamine"* and *"6-bromoindoline-2,3-dione"* as reactants, to synthesize *"1,4,8-tribromo-6H-indolo[2,3-b]quinoxaline"*. To increase the solubility, I have used two different alkyl chains; one is N-bromo octane and the other is 2-ethyl hexyl bromide on isatin's nitrogen. The structural flexibility of quinoxaline, along with its availability and electron-withdrawing properties, has led to the creation of numerous optoelectronic materials based on quinoxaline. The energy conservation applications of these fused ring quinoxalines are explored in detail under my work. I have investigated their suitability as organic materials in optoelectronic devices, organic solar cells, OFETs and organic light-emitting diodes (OLEDs). The optical and electronic properties of these materials are thoroughly examined and light is shed on their potential in harvesting and storing energy. The potential of these respective materials as green substitutes for energy conservation technologies are highlighted by an assessment of their cost-effectiveness and environmental sustainability.