A study of fluorine substitution on solution processable benzo [1, 2, 5] thiadiazole based copolymers for optoelectronic applications

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Polymer solar cells (PSCs) have attracted great attention in recent years due to their advantages of low cost, light-weight, easy fabrication and capability to be fabricated into large area flexible devices. Herein, we designed and synthesized a series of four novel thermally stable low- band-gap (LBG) conjugated polymers (P1-P4) based on benzo [1,2,5] thiadiazole (BT) as a building block. BT is well known electron-withdrawing unit which has been sandwiched with two electrons donating octylthiophene units; a monomer in this designed polymer series. We copolymerized with various fluorinated and non-fluorinated BT in order to compare optoelectronic properties. The thermal stability of the polymers is studied by differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). Optical properties of the polymers are measured by UV-Visible spectrophotometer. Theoretical calculations (DFT studies) and electrochemical cyclic voltammetry (CV) measurement suggested that the fluorine atom could decrease the molecular energy levels highest occupied molecular orbital and lowest unoccupied molecular orbital (HOMO and LUMO) of the resulting polymers distinctly. Presence of fluorine atom in the conjugated backbone tunable optoelectronic properties could be expected. Moreover, we discuss the effect of the fluorine atom on the absorption spectra, crystalline properties, hole mobilities, and blend morphologies of the conjugated polymers.

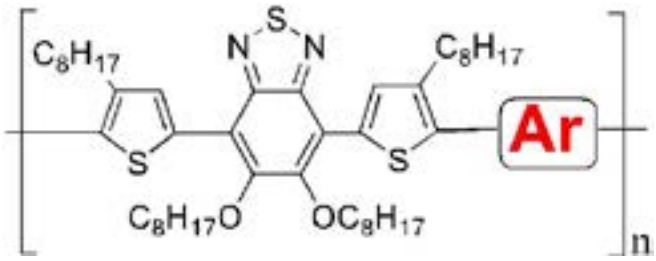

Figure 1. benzo [1,2,5] thiadiazole based conjugated polymers

Biography

Amira Abouhadid is an undergraduate is Chemical Engineering student at Texas A&M University at Qatar.

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