Design, Synthesis and Characterization of 3-Dodedyl-2,5-Poly(thienylenevinylene) Polymer

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Abstract

Polymers containing both donor and acceptor units may be potentially useful for light harvesting applications. [1] As the need for renewable and clean energy source is expanding, organic or plastic photovoltaic materials may offer lightweight, flexible shape and cost-effective renewable solar energy solutions.[2] A recently developed organic and polymeric conjugated semi-conducting materials appear very promising for the development of future high-efficiency photovoltaic cell due to their ultra- fast opto-electronic response. Poly(thienylenevinylenes) PTV's exhibits low bandgap and moderate charge transport. The objective of this experiment is to synthesize mono end functionalized 3-Dodedyl-2,5-Poly(thienylenevinylene) (PTV) with a C_{12} side chain. 3-Dodedyl-2,5- Poly(thienylenevinylene) was prepared in seven steps using nickel-catalyzed Grignard reaction, bromination, formulation, reduction, chlorination, phosphate ester formation, formulation and polymerization. Proton and Carbon NMR was used to characterize and identified unknown organic compounds. The characterizations include proton NMR, elemental analysis, UV-VIS spectrometry, photoluminensce, gel permeation chromatography, differential scanning calorimetry, thermal gravitational analysis, and cyclovoltametry will be further discussed.

In conclusion, a mono-end functionalized PTV has been successfully synthesized. Solubility of PTV is good especially in hot organic solvents (chloroform, THF).

It is observed that solubility increases with the length of polymer. UV-VIS spectra determine the lambda max to be 561 nm, cut off wavelength to 711 nm and band gap of 1.75 eV.

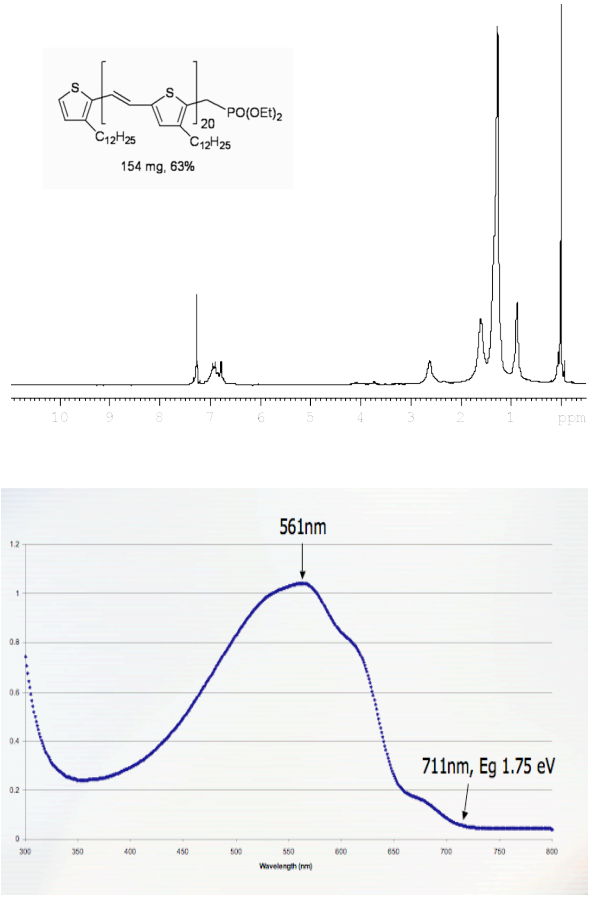

Figure 1. (a) Proton NMR for PTV polymer. (b) UV-VIS spectra of PTV. The lambda max 561 nm, the cut off lambda max 711 nm and the band gap 1.75 eV.

[1] Sun S, Fan Z, Wang Y, Haliburton J, Vick S, Choi S, Ledbetter A, Bonner C. J. Poly. Sci. part A. 2002: 1-32.
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