

DISSERTATION INFORMATION

Dissertation's title: Synthesis and Characterization of conjugated polymers oriented for fluorescence chemosensor

Major: Engineering Mechanics

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The main results of this dissertation:

The materials science industry is always researching and finding new materials that are more "smart" and effective. Conjugated polymer materials are polymers with alternating double and single bond structures. Therefore, they have a very interesting property, which is the property of conducting electricity due to the continuous displacement of electron flow. Based on these properties, they are researched and applied in many fields, especially in the field of semiconductor materials.

This dissertation describes the research relating to the synthesis, characterization, and diblock conjugated polymers based on poly(3-hexylthiophene) which is toward the fluorescence sensor materials application for the detector of explosive TNT compound. In addition, this research also aims the synthesis of donor–acceptor conjugated polymers and small molecules used to trace the mesotrione which is one of the most toxic compounds used in pesticides.

The results showed successful synthesis a rod coil diblock copolymer P3HT-*b*-P(DMAEMA-*r*-PyMA) based on P3HT as rod segment and P(DMAEMA-*r*-PyMA) as a coil segments has been successfully synthesized via the combination of the GRIM method and ATRP polymerization methods. P3HT-*b*-P(DMAEMA-*r*-PyMA) was well characterized to determine its chemical structure and optical properties. The obtained diblock copolymer exhibited a controlled molecular weight of 11300 g/mol with a narrow dispersion index of 1.42. The diblock copolymers P3HT-*b*-P(DMAEMA-*r*-

PyMA) showed the sensory property in tracing explosive TNT compounds through a fluorescence quenching due to the Forster resonance energy transfer mechanism.

For mesotrione detector application, the conjugated molecules based on pyrene and 4-(2-ethylhexyl)-2-(pyren-1-yl)-4H-dithieno [3,2-b:2',3'-d]pyrrole have been successfully synthesized via direct arylation reaction. The obtained conjugated molecules have been used for tracing mesotrione compound through FRET with high sensitivity of K_{SV} of 5570 and 6520 M^{-1} for EP4HP and EDP4HP, respectively. The materials based on the EP4HP and EDP4HP compounds are promising candidates for technical application for mesotrione detection as a chemosensor.

Advisor

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