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SUBSTITUTION ON CARBON OR SULFUR ATOM OF DERIVATIZED  
POLYTHIOPHENES

Mr. Peerayost Somchinda

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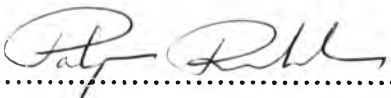
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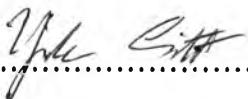
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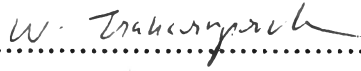
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พีรยลต์ สมจินดา : การเติมหมู่แทนที่บนคาร์บอนหรือซัลเฟอร์อะตอมของอนุพันธ์พอลิไทโอฟีน (SUBSTITUTION ON CARBON OR SULFUR ATOM OF DERIVATIZED POLYTHIOPHENES) อ.ที่ปรึกษา: ผศ.ดร. ยงศักดิ์ ศรีธนาอนันต์; อ.ที่ปรึกษาร่วม: ผศ.ดร. วรวรรณ พันธุ์นาวิณ; 99 หน้า. ISBN : 974-14-1993-7.

งานวิจัยนี้ศึกษาการเพิ่มหมู่แทนที่ลงบนอนุพันธ์ไทโอฟีนและพอลิไทโอฟีน โดยปฏิกิริยาที่ศึกษา คือ เอซิลเลชัน โบรมิเนชัน เอส-เอซิลเลชัน และ เอส-เมทิลเลชัน ปฏิกิริยาเอซิลเลชันด้วยอะเซทิลคลอไรด์ บนไทโอฟีนได้สารผสมหลายชนิดที่ไม่สามารถแยกและระบุชนิดได้ ผลจากโปรตอนเอ็นเอ็มอาร์พบว่าอาจมีโปรตอนของหมู่อะเซทิลปะปนอยู่บ้างในของผสม ปฏิกิริยาเดียวกันบนพอลิไทโอฟีนได้ของแข็งสีน้ำตาลที่ไม่สามารถละลายได้ในตัวทำละลายใดๆ และพบหมู่อะเซทิลจากการตรวจสอบด้วยเทคนิคอินฟราเรดสเปกโทรสโกปี ปฏิกิริยาโบรมิเนชันที่ ใช้เอ็นโบรมอสักซินไมด์ ได้ผลิตภัณฑ์จากปฏิกิริยาบนไทโอฟีน คือ 2,5-ไดโบรมไทโอฟีน ปฏิกิริยาบนพอลิไทโอฟีน ได้ของแข็งสีน้ำตาลที่ไม่สามารถละลายได้ในตัวทำละลายใดๆ ปฏิกิริยาบนพอลิ(3-เฮกซิลไทโอฟีน) ได้พอลิ(3-เฮกซิลไทโอฟีน) ที่มีหมู่แทนที่โบรมิที่ตำแหน่งที่ 4 ปฏิกิริยาเอส-เอซิลเลชันที่ผ่านการจับเบนซีนอินเตอร์มีเดียตไม่ประสบความสำเร็จกับสารตั้งต้นทุกประเภท ส่วนปฏิกิริยาเอส-เอซิลเลชันที่ใช้เกลือไดเฟนิลไอโอดีนียม บนพอลิ(3-เฮกซิลไทโอฟีน) พบค่าการดูดกลืนแสงของตะกอนผลิตภัณฑ์ที่ความยาวคลื่น 700 นาโนเมตร ปฏิกิริยาเอส-เมทิลเลชัน ใช้เมทิลไอโอดด์ บนไทโอฟีนได้ผลิตภัณฑ์ที่ต้องการ จากการตรวจสอบด้วยโปรตอนเอ็นเอ็มอาร์สเปกโทรสโกปี

สาขาวิชา ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์ ลายมือชื่อนิสิต.....พีรยลต์

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ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

# # 4672358223: MAJOR PETROCHEMISTRY AND POLYMER SCIENCE

KEYWORD: CONDUCTIVE POLYMER/POLYTHIOPHENE/POLY(3-HEXYLTHIOPHENE)

PEERAYOST SOMCHINDA: SUBSTITUTION ON CARBON OR SULFUR ATOM OF DERIVATIZED POLYTHIOPHENES. THESIS ADVISOR: ASST. PROF. YONGSAK SRITANA-ANANT, Ph.D., THESIS COADVISOR: ASST. PROF. WORAWAN BHANTHUMNAVIN, Ph.D., 99 pp. ISBN : 974-14-1993-7.

This research studied the incorporation of substituents on thiophene and polythiophene derivatives. The reactions under investigation were bromination, acylation, *S*-arylation, and *S*-methylation. The acylation with acetyl chloride onto thiophene was found to give mostly unseparable and unidentifiable mixture. The <sup>1</sup>H NMR spectrum of the mixture indicated some signals that could correspond to protons of acetyl group. The acetylation of polythiophene yielded insoluble brown solid, which could be characterized only by the presence of acetyl carbonyl peak in IR spectroscopy. The bromination using *N*-bromosuccinimide (NBS) obtained deep red liquid of 2,5-dibromothiophene. The bromination on polythiophene gave insoluble brown solid while the reaction on poly(3-hexylthiophene) successfully gave the 4-substituted product. The *S*-arylation through trapping of benzyne intermediate did not yield the products with all tested substrates. The *S*-arylation using diphenyliodonium salts on poly(3-hexylthiophene) obtained insoluble black solid with absorption at 700 nm. The *S*-methylation using methyl iodide on thiophene yielded the desired product verified by <sup>1</sup>H-NMR spectroscopy.

Field of study Petrochemistry and Polymer Science Student's signature *Peerayost*

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## LIST OF ABBREVIATIONS

[o]	: oxidation
°C	: degree celsius
μL	: microliter
μmol	: micromole
A	: absorbance
AlCl <sub>3</sub>	: aluminium chloride anhydrous
CDCl <sub>3</sub>	: deuterated chloroform
CHCl <sub>3</sub>	: chloroform
CH <sub>2</sub> Cl <sub>2</sub>	: dichloromethane
CH <sub>3</sub> COOH	: acetic acid
cm <sup>-1</sup>	: per centimeter
FeCl <sub>3</sub>	: ferric chloride
g	: gram
GPC	: gel permeation chromatography
HH	: head to head
h	: hour
HT	: head to tail
IR	: infrared spectrophotometer
<i>M<sub>n</sub></i>	: number average molecular weight
<i>M<sub>w</sub></i>	: weight average molecular weight
MeOH	: methanol
MeI	: methyl iodide
mg	: milligram
min	: minute
mL	: milliliter
mmol	: millimole
NaHCO <sub>3</sub>	: sodium hydrogen carbonate
NBS	: <i>N</i> -bromosuccinimide
nm	: nanometre

NMR	: nuclear magnetic resonance spectroscopy
P3AT	: poly(3-alkylthiophene)
P3HT	: poly(3-hexylthiophene)
ppm	: part per million
PT	: polythiophene
TFA	: trifluoroacetic acid
THF	: tetrahydrofuran
TT	: tail to tail
UV	: ultra-violet