

การสังเคราะห์สารทำเครื่องหมายในน้ำมันปิโตรเลียมจากลิเนียร์แอลคิลเบนซีน
และอนุพันธ์แอนิลีน

นางสาวศศิธร สุขสอน

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์ หลักสูตรปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์

คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2543

ISBN 974-347-233-9

ลิขสิทธิ์ของ จุฬาลงกรณ์มหาวิทยาลัย

SYNTHESIS OF PETROLEUM MARKERS FROM LINEAR ALKYL BENZENE
AND ANILINE DERIVATIVES

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Petrochemistry and Polymer Science

Program of Petrochemistry and Polymer Science

Faculty of Science

Chulalongkorn University

Academic Year 2000

ISBN 974-374-233-9

ศศิธร สุขสอน : การสังเคราะห์สารทำเครื่องหมายในน้ำมันปิโตรเลียมจากลิเนียร์แอลคิลเบนซีนและอนุพันธ์แอนิลีน (SYNTHESIS OF PETROLEUM MARKERS FROM LINEAR ALKYL BENZENE AND ANILINE DERIVATIVES) อาจารย์ที่ปรึกษา : รศ.ดร.อมร เพชรสม; 164 หน้า. ISBN 974-347-233-9

ได้สังเคราะห์สารทำเครื่องหมายในน้ำมันปิโตรเลียมจากปฏิกิริยาคู่ควบระหว่างลิเนียร์แอลคิลแอนิลีนที่ได้จากปฏิกิริยาในแคตชันและรีดักชันของลิเนียร์แอลคิลเบนซีน กับสารประกอบเกลือไดอะโซเนียมของอนุพันธ์แอนิลีน และจากปฏิกิริยาคู่ควบระหว่างสารประกอบเกลือไดอะโซเนียมของลิเนียร์แอลคิลแอนิลีน กับอนุพันธ์แอนิลีนและอนุพันธ์ฟินอล สารทำเครื่องหมายที่สังเคราะห์ได้สามารถผสมในน้ำมันดีเซลหมุนเร็วที่ความเข้มข้น 0.5 ถึง 15 ส่วนในล้านส่วน เมื่อตรวจวัดโดยใช้สัดส่วนตามปริมาตรของน้ำมันดีเซลหมุนเร็วต่อตัวสกัดเป็น 6 ต่อ 1 และยังสามารถผสมสารทำเครื่องหมายเหล่านี้ลงในน้ำมันดีเซลหมุนเร็วที่ความเข้มข้น 5 ส่วนในล้านส่วน ยกเว้น 2-คลอโร-4-ไนโตร-6-(4-ลิเนียร์แอลคิล)-ฟีนิลเอโซแอนิลีนที่สามารถผสมได้ที่ความเข้มข้น 3 ส่วนในล้านส่วน เมื่อใช้สัดส่วนตามปริมาตรที่เหมาะสมของน้ำมันดีเซลหมุนเร็วต่อตัวสกัด ระบบสกัดที่เหมาะสมคือเอทิลีนไดเอมีน 50 เปอร์เซ็นต์ในโพรพิลีนไกลคอล 20 เปอร์เซ็นต์และเมทานอล 30 เปอร์เซ็นต์ โดยใช้เวลาในการเขย่า 30 วินาที การสกัดเป็นการวิเคราะห์ทางคุณภาพที่จะเกิดสีเด่นชัดในชั้นสกัด ซึ่งสามารถนำมาวิเคราะห์หาปริมาณของสารทำเครื่องหมายได้ด้วยเทคนิคทางอัตรากวอดเรตและวิสิเบิลสเปกโตรโฟโตเมตรี จากการทดสอบด้วยวิธีการตาม ASTM พบว่า สมบัติทางกายภาพของน้ำมันดีเซลหมุนเร็วที่เติมสารทำเครื่องหมายไม่มีความแตกต่างจากน้ำมันดีเซลหมุนเร็วที่ไม่เติมสารทำเครื่องหมาย นอกจากนั้นสารทำเครื่องหมายนี้ยังสามารถคงตัวหลังจากเติมในน้ำมันเป็นเวลาอย่างน้อย 3 เดือน

สาขาวิชา.....ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์.....ลายมือชื่อนิติศ.....

หลักสูตร.....ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์.....ลายมือชื่ออาจารย์ที่ปรึกษา.....

ปีการศึกษา.....2543.....

4172454323 : MAJOR PETROCHEMISTRY AND POLYMER SCIENCE
SASITORN SUKSORN: SYNTHESIS OF PETROLEUM MARKERS FROM
LINEAR ALKYL BENZENE AND ANILINE DERIVATIVES. THESIS
ADVISOR: ASSOC. PROF. AMORN PETSOM. Ph.D. 164 pp. ISBN 974-
347-233-9

Petroleum markers were synthesized by a coupling reaction of linear alkyaniline, which was obtained from nitration and reduction reactions of linear alkylbenzene, with diazonium salt of aniline derivatives, and by a coupling reaction of diazonium salt of linear alkyaniline with both aniline and phenol derivatives. The synthesized markers were added into high-speed diesel (HSD) at 0.5 to 15 ppm and they were detected using the volume ratio of marked HSD to extractant as 6:1. Moreover, these markers were added into HSD at 5 ppm except for 2-chloro-4-nitro-6-(4-linear alkyl)phenyl azo aniline that was added at 3 ppm using individual volume ratio of each marked HSD to extractant. The suitable extractant system was 50% ethylenediamine in 20% propylene glycol and 30% methanol using 30 seconds of shaking time. Extraction was the qualitative determination giving the distinctive color in the extracted phase, which could be quantitatively determined by UV/VIS spectrophotometry. From the ASTM testing method, the physical properties of marked HSD were similar to those of unmarked HSD. Furthermore, these markers are stable in diesel fuel after at least 3 months storage.

Department.....Petrochemistry and Polymer Science.....Student's signature.....
Field of study.....Petrochemistry and Polymer Science.....Advisor's signature.....
Academic year.....2000.....

ACKNOWLEDGEMENT

It is my deepest gratitude to express sincere thank to my advisor, Associate Professor Dr. Amorn Petsom. Without his valuable instruction, concern, and efficient encouragement this study would not have been accomplished. Thanks are also extended to Associate Professor Dr. Sophon Roengsumran for his helpful discussion and support.

I would like to thank the Chairman and Members of the thesis committee, Associate Professor Dr. Supawan Tantayanon, Associate Professor Dr. Wimonrat Trakarnpruk, Associate Professor Dr. Anongrat Karntiang and Associate Professor Dr. Sophon Roengsumran for providing critical comments and helping me improve the quality of my thesis.

I also very much appreciate the help of Mrs. Ratanavalee In-Ochanon and the staffs of the quality Control Division, the Petroleum Authority of Thailand for their kind permission to use the UV-VIS spectrophotometer and all ASTM testing apparatuses. I gladly acknowledge the help of the Chemistry Department, Chulalongkorn University for the IR, NMR, and MS facilities.

I am grateful to my family for their love, understanding, and encouragement throughout the entire course of study. Finally, I thank all my friends for their pleasure and encouragement.

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ABBREVIATIONS

A	Absorbance
ASTM	The American Society for Testing and Materials
Ave	Average
cSt	CentiStroke
°C	Degree Celsius
ϵ	Molar absorptivity
FT-IR	Fourier-Transformed infrared spectroscopy
<i>br</i>	Broad
cm^{-1}	Unit of wavenumber
m	Middle
s	Strong
w	Weak
Hz	Hertz
hr	Hour
IBP	Initial Boiling Point
kPa	KiloPascal
ml	millilitre
nm	Nanometer
λ_{max}	Maximum wavelength
NMR	Nuclear magnetic resonance spectroscopy
<i>br</i>	Broad
δ	Chemical shift
<i>d</i>	Doublet
<i>dd</i>	Doublets of doublet
J	Coupling constant
<i>m</i>	Multiplet
<i>s</i>	Singlet
<i>t</i>	Triplet
<i>td</i>	Triplets of doublet

ABBREVIATIONS (Cont.)

ppm	Part per million
UV/VIS	Ultraviolet/Visible spectrophotometry