

**MICROEMULSION FORMATION OF MOTOR OIL
WITH MIXED SURFACTANT OF ALCOHOL ETHOXYLATES AND
SORBITAN MONOOLEATE WITHOUT ADDED ALCOHOL**




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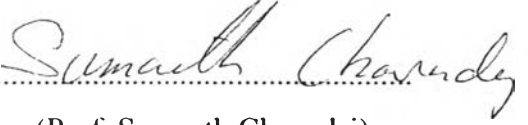
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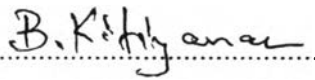
Thesis Title: Microemulsion Formation of Motor Oil with Mixed Surfactant of Alcohol Ethoxylates and Sorbitan Monooleate without Added Alcohol
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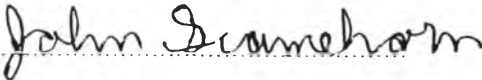

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ABSTRACT

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The aim of this research was to investigate the microemulsion formation of motor oil with alcohol ethoxylate (AEs), nonionic surfactant derived from plam oil, without adding alcohol. The alcohol ethoxylate surfactants with different ethoxylate groups (AE3, AE7 and AE9) were mixed with methylester sulphonate (MES) and sorbitan monooleate (Span 80) for forming microemulsions with motor oil at various temperatures (20°C, 30°C, 40°C, and 50°C). Span 80 used as a lipophilic linker that was found to be crucial to the formation of these microemulsion systems. The mixed surfactant system of AE3 and AE7 (2:1) with Span 80 was found to form middle phase microemulsions (Winsor Type III) at relatively low surfactant concentrations. For all of the studied surfactant systems, temperature showed a significant effect on the microemulsion phase transformation and the lowest values of the critical microemulsion concentrations were achieved at 50°C.

บทคัดย่อ

สนิทัศน์ อีสรียันเรศ : การเกิดไมโครอิมัลชันของน้ำมันเครื่องด้วยการผสมสารลดแรงตึงผิวระหว่างแอลกอฮอล์ อีท็อกซีเลท และซอร์บิแทน โมโนโอเลเอต โดยไม่เติมแอลกอฮอล์ (Microemulsion Formation of Motor Oil with Mixed Surfactants of Alcohol Ethoxylate and Sorbitan Monooleate without Added Alcohol) อ. ที่ปรึกษา : ศ. ดร. สุเมธ ชวเดช และ ศ. จอห์น เอฟ. สกามีฮอร์น 54 หน้า

งานวิจัยนี้ได้มุ่งศึกษาพฤติกรรมการเปลี่ยนแปลงวิฤภาคของการเกิดไมโครอิมัลชันของน้ำมันเครื่องกับแอลกอฮอล์ อีท็อกซีเลท ที่มีหมู่อีโอ (EO Group) จำนวนแตกต่างกันตั้งแต่ 3, 7 และ 9 หมู่ โดยเติมสารลดแรงตึงผิวร่วมที่มีความขาวสายโซ่ยาวเพื่อช่วยในการเกิดวิฤภาคต่างแทนการเติมแอลกอฮอล์ซึ่งส่งผลกระทบต่อผลิตภัณฑ์ และ สิ่งแวดล้อม ในช่วงอุณหภูมิ 20, 30, 40 และ 50 องศาเซลเซียส โดยการสังเกตการณ์เปลี่ยนแปลงวิฤภาคของแต่ละระบบหลังเข้าสู่สมดุลแล้วนำมาสร้างพีซีไดอะแกรมเพื่อหาค่าความเข้มข้นของสารลดแรงตึงผิวและสารลดแรงตึงผิวร่วมต่ำสุดที่ทำให้เกิดวิฤภาคชั้นกลางของไมโครอิมัลชัน (วินเซอร์แบบที่ 3) นอกจากนี้ยังหาค่าความสามารถในการละลาย และค่า CMC ของแต่ละระบบอีกด้วย จากการศึกษาพบว่า การใช้แอลกอฮอล์ อีท็อกซีเลท ซึ่งมีหมู่อีโอ 7 หมู่ สามารถช่วยให้เกิดวิฤภาคชั้นกลางของไมโครอิมัลชันได้เป็นอย่างดี สำหรับการศึกษาค้นคว้าของอุณหภูมิต่อการเกิดไมโครอิมัลชัน พบว่าเมื่ออุณหภูมิเพิ่มขึ้น ส่งผลให้ค่าความเข้มข้นของสารลดแรงตึงผิวและสารลดแรงตึงผิวร่วมต่ำสุดที่ทำให้เกิดวิฤภาค ชั้นกลางของไมโครอิมัลชันมีค่าลดลง

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ABBREVIATIONS

| | |
|-----------------|--|
| AEs | Alcohol ethoxylate |
| MES | Methyl ester sulfonate |
| EO | Ethylene oxide |
| CMC | Critical micelle concentration |
| $C_{\mu}C$ | Critical microemulsion concentration |
| IFT | Interfacial tension |
| SP | Solubilization Parameter |
| SP _w | Volume of water solubilized per weight of total surfactants in the microemulsion phase |
| SP _o | Volume of oil solubilized per weight of total surfactants in the microemulsion phase |
| V _w | Phase height fraction of water |
| V _o | Phase height fraction of oil |

LIST OF SYMBOLS

| | |
|---------------|---|
| α | Weight fraction of oil in oil and water mixture |
| δ | Weight fraction of MES in alcohol ethoxylate(EO3) and MES |
| γ_{mw} | Interfacial tension of microemulsion-water interface |
| γ_{mo} | Interfacial tension of microemulsion-oil interface |