DETERGENCY OF OILY SOIL BY MICROEMULSION

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ABSTRACT

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Detergency is the process of removal of unwanted material from a solid surface by contact with a surfactant solution. It is hypothesized that both ultra-low interfacial tension and high solubilization play importance roles in promoting detergency efficiency. The objective of this study was to investigate the relationship between the phase diagram and the efficiency of detergency for microemulsion system with low salinity. A mixed surfactant system of 0.5% alkyldiphenyloxide disulfonated (ADPODS), 5% sodiumdioctyl sulfosuccinate (AOT) and 3% sorbitan monooleate (Span 80) was found to exhibit Winsor type III microemulsion at 0.5% salinity. In using this formulation, the detergency performance increased with increasing active surfactant concentration, and optimum oily soil removal was found to be at around 0.1% active surfactant. The result showed that the studied formulation could remove more than 80% oil. Increasing the amount of rinsing water did not significantly affect the detergency performance. However, the detergency performance increased with salinity, and maximum oil removal was found to be at 3% NaCl.

บทคัดย่อ

นางสาวพรรณฑิภา รัชตเวชกุล : การซักฟอกคราบน้ำมันโดยวิธีการไมโครอิมัลชัน (Detergency of Oily Soil by Microemulsion) อ. ที่ปรึกษา: รศ. ดร. สุเมธ ชวเดช, ศ. ดร. จอห์น เอฟ สเกมาฮอร์น, ผศ. ดร.บุนยรัชต์ กิติยานันท์ และ ดร. จันทรา ทองคำเภา 48 หน้า ISBN 974-9651-99-5

การซักฟอกเป็นกระบวนการกำจัดวัสดุที่ไม่ต้องการออกจากผิวของแข็ง โดยสัมผัสของสารละลายที่มีสารซักฟอก โดยมีสมมุติฐานว่าทั้งแรงตึงผิวที่ต่ำมากและการละลายที่สูงมีบทบาทสำคัญในการซักล้าง วัตถุประสงค์ของการศึกษาครั้งนี้ คือ เพื่อกาความสัมพันธ์ระหว่างเฟสไดอะแกรมและประสิทธิภาพในการซักล้างของระบบไมโครอิมัลชั่นที่เกลือต่ำ

สูตรสารลดแรงตึงผิวผสมของน้ำมันเครื่อง ประกอบด้วย อัลคิล ไดฟีนิลออกไซด์ไดซัลโฟเนต (Alkyl diphenyl oxide disulfonate) หรือเอดีพีโอดีเอส (ADPODS) และไดออกทิลซัลโฟซัคซิเนต (Dioctyl oxide disulfonate) หรือ เอโอที (AOT) และซอร์บิแทน โมโนโอลิเอต (Sorbitan monooleate) หรือ สแปน 80 (Span 80) พบว่า 0.5% ADPODS, 5% AOT, 3% Span 80 สามารถเกิดไมโครอีมัลชั่น วินเซอร์ชนิดที่ III โดยใช้เกลือ 0.5 % ในการใช้สูตรนี้ ประสิทธิภาพการซักล้างเพิ่มขึ้นเมื่อความเข้มข้นของสารลดแรงตึงผิวผสมมากขึ้น และพบว่าจุดที่เหมาะสมในการกำจัดคราบน้ำมันอยู่ที่ 0.1 % ผลการทดลองแสดงให้เห็นว่าสูตรที่ใช้สามารถกำจัดคราบน้ำมันได้มากกว่า 80 % การเพิ่มปริมาณน้ำล้างไม่มีผลต่อประสิทธิภาพการซักล้าง อย่างไรก็ตามประสิทธิภาพการซักล้างเพิ่มขึ้นตามเกลือที่ใช้และคราบน้ำมันถูกกำจัดออกมากที่สุดที่เกลือ 3 %

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ABBREVIATIONS

ADPODS	Alkyl diphenyl oxide disulfonate
AOT	Aerosol-OT or dioctyl sodium sulfosuccinate
EACN	Equivalent alkane carbon number
HLB	Hydrophilic-lypophilic balance
IFT	Interfacial tension (mN/m)
IFTm/o	Interfacial tension between middle phase and excess oil phase (mN/m)
IFTm/w	Interfacial tension between middle phase and excess water phase (mN/m)
IFTo/w	Interfacial tension between oil and water (mN/m)
O/W	Oil-in-water microemulsion
W/O	Water-in-oil microemulsion
PIT	Phase inversion temperature
S*	Optimum salinity (wt%)
SP*	Optimum solubilization parameter (ml/g)
SP	Solubilization parameter (ml/g)
Spo	Solubilization parameter of oil (ml/g)
SPw	Solubilization parameter of water (ml/g)

LIST OF SYMBOLS

θ	Contact angle (degree)
ρ	Density (g/ml)
d	Diameter (mm)
$\gamma_{O/M}$	Interfacial tension between excess oil phase and middle phase (mN/m)
$\gamma_{W/M}$	Interfacial tension between excess water phase and middle phase (mN/m)
γ_{OB}	Interfacial tension at the liquid soil-bath interface (mN/m)
γ_{OS}	Interfacial tension at the liquid soil-substrate interface (mN/m)
γ_{SB}	Interfacial tension at the substrate-bath interface (mN/m)