

**MICROEMULSION FORMATION OF SURFACTANT/OILY
WASTEWATER SYSTEM RELATED TO CLEAN-UP BY FROTH
FLOTATION**

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บทคัดย่อ

อนูรดี วิทยาปัญญาานนท์ การเกิดไมโครอิมัลชันของน้ำเสียที่มีน้ำมันปนเปื้อนโดยใช้สารลดแรงตึงผิว และความสัมพันธ์เกี่ยวกับกระบวนการแยกแบบทำให้ลอย (Microemulsion formation of surfactant/oily wastewater system and related to clean-up by froth flotation) อ. ที่ปรึกษา รศ. ดร. สุเมธ ชวเดช และ ศ.จอห์น เอฟ สเตรม์มอร์น, 71 หน้า ISBN 974-17-2274-5

กระบวนการทำให้ลอย (froth flotation) เป็นกระบวนการแยกสารโดยใช้สารลดแรงตึงผิว และถูกนำไปประยุกต์ใช้ในการแยกน้ำมันออกจากน้ำเสีย เนื่องจากใช้พลังงานในการทำงานต่ำ ราคาถูก และให้ประสิทธิภาพในการทำงานสูง วัตถุประสงค์งานวิจัยนี้ เพื่อหาความสัมพันธ์การกำจัดน้ำมันโดยกระบวนการทำให้ลอยกับแรงตึงผิวระหว่างเฟสที่มีค่าต่ำมากๆ เอทิลเบนซินเป็นสารอะโรมาติกส์ชนิดหนึ่งซึ่งถูกนำมาใช้กันอย่างแพร่หลายในอุตสาหกรรมต่างๆ ได้นำมาใช้เป็นน้ำมันตัวอย่างในการศึกษาประสิทธิภาพของกระบวนการทำให้ลอยแบบกะ สารลดแรงตึงผิวชนิดที่มีประจุลบแบบเดี่ยวคือ โซเดียม ได-1,3 ไดเมทิลบิวทิล ซันโฟร์ซัคซิเนต (AMA) และสารลดแรงตึงผิวชนิดที่มีประจุลบแบบผสม คือ โซเดียม บิส-ทู-เอทิลเฮกซิลซัลโฟซัคซิเนต (AOT) และ คาวน์แฟกซ์ 8390 (Dowfax 8390) ถูกเลือกมาใช้ในการศึกษาการเกิดไมโครอิมัลชันกับเอทิลเบนซิน ผลการทดลองพบว่าระบบที่ใช้สารลดแรงตึงผิวแบบเดี่ยวโซเดียม ได-1,3 ไดเมทิลบิวทิล ซันโฟร์ซัคซิเนตที่มีความเข้มข้น 0.3 เปอร์เซ็นต์และมีความเข้มข้นของโซเดียมคลอไรด์ 3 เปอร์เซ็นต์ ให้ประสิทธิภาพสูงสุดในการแยกเอทิลเบนซินออกจากน้ำโดยใช้กระบวนการลอยแบบกะ (99.55 เปอร์เซ็นต์) แต่ระบบดังกล่าวไม่ได้เป็นระบบที่มีค่าแรงตึงผิวระหว่างเฟสที่ต่ำที่สุด นอกจากนี้ยังพบว่า ระบบที่ใช้สารลดแรงตึงผิวแบบผสมไม่สามารถทำให้เกิดการแยกน้ำมันออกจากน้ำได้โดยใช้กระบวนการลอย ทั้งนี้เนื่องจากความไม่เสถียรของฟอง ดังนั้นจึงสรุปได้ว่า ค่าแรงตึงผิวที่ต่ำมากของการเกิดไมโครอิมัลชันชนิดที่ 3 ไม่ใช่เป็นปัจจัยเดียวที่สำคัญต่อการเพิ่มประสิทธิภาพการทำงานของกระบวนการลอย แต่ยังมีปัจจัยอื่นๆ ที่มีอิทธิพลต่อประสิทธิภาพของกระบวนการทำให้ลอย เช่น ความสามารถในการเกิดฟองและความเสถียรของฟอง เป็นต้น

ABSTRACT

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KEY WORD : Froth flotation/Microemulsion/Interfacial tension/Ethylbenzene

Froth flotation, which is a surfactant-based separation technique, has become a new alternative to treat oil-containing wastewaters. The objective of the present work was to correlate the oil removal by froth flotation to the ultra-low interfacial tension. Ethylbenzene, which is widely used in many industrial applications, was used as a model oil contaminant for studying the removal efficiency by batch mode. A single surfactant (sodium di-1,3-dimethylbutyl sulfosuccinate, AMA) and mixed surfactants (sodium bis-2-ethylhexylsulfosuccinate, AOT, and mono- and dihexadecyl diphenyloxide disulfonate sodium salt, Dowfax8390) were selected to form microemulsion with ethylbenzene. Result showed that at 3 % NaCl the system 0.3 % AMA provided the maximum oil removal (99.55 %) but did not correspond to the minimum interfacial tension found in Winsor's type III microemulsion. In addition, flotation using the mixed surfactant was not achieved due to the low stability of the froth. It is concluded that the ultra low interfacial tension of the middle-phase microemulsion is not the sole factor affecting the flotation process. Foam ability and foam stability are other parameters involving oil removal efficiency in the froth flotation process.

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ABBREVIATION

AMA	Sodium di-1,3-dimethylbuty sulfosuccinate
AOT	Sodium bis-2-ethylhexylsulfosuccinate
Dowfax	di-hexadecyl diphenyloide disulfonate sodium salt
EB	Ethylbenzene
GC	Gas chromatography
IFT	Interfacial tension (mN/m)
IFT _{o/md}	Interfacial tension between oil and middle phase (mN/m)
IFT _{w/md}	Interfacial tension between water and middle phase (mN/m)
SP	Solubilization parameter (mL/g)
SP _o	Solubilization parameter of oil (mL/g)
SP _w	Solubilization parameter of water (mL/g)

LIST OF SYMBOLS

ρ	Density
γ	Interfacial tension (mN/m)
$\gamma_{o/md}$	Interfacial tension between oil and middle phase (mN/m)
$\gamma_{w/md}$	Interfacial tension between water and middle phase (mN/m)