

**RECOVERY OF MIXED SURFACTANTS FROM WATER
USING MULTI-STAGE FOAM FRACTIONATION**

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ABSTRACT

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Surfactants are widely used in many industries, such as healthcare, food processing, and textile, as well as several surfactant based separation processes, and the effluent streams of these processes usually contain surfactants that need to be removed and recovered for both environmental and economic reasons. In this work, a multi-stage foam fractionation column using bubble-cap trays was used to recover surfactants from aqueous solution in both single and mixed systems of a cationic surfactant, cetylpyridiniumchloride (CPC), and a nonionic surfactant, octylphenoxypolyethoxyethanol (OPEO₁₀). From the experimental results, the enrichment ratio increased with decreasing air and liquid feed flow rates, and with increasing foam height. The effect of foam height on the surfactant recovery was not as significant as it was on the enrichment ratio. In contrast, surfactant recovery was strongly affected by the changes in air and liquid flow rates. In single surfactant systems, both surfactant recovery and enrichment ratio obtained in the OPEO₁₀ system were higher than in the CPC system. Synergism was observed in the mixed surfactant system, which led to a total recovery of OPEO₁₀.

บทคัดย่อ

มนัสชนก ตริโรจน์ : การนำสารลดแรงตึงผิวกลับมาใช้ใหม่โดยใช้ Multistage Foam Fractionation Column (Recovery of Mixed Surfactants from Water Using Multi-Stage Foam Fractionation) อ. ที่ปรึกษา : รศ.ดร. สุเมธ ชวเดช, ศ. จอห์น เอฟ สกEMAฮอร์น และผศ. ดร. ปมทอง มาลากุล ณ อยุธยา 58 หน้า ISBN 974-9651-96-0

ในปัจจุบันนี้ได้มีการนำสารลดแรงตึงผิวมาใช้ในอุตสาหกรรมต่าง ๆ อย่างแพร่หลาย ทำให้มีการสูญเสียสารลดแรงตึงผิวไปกับน้ำที่ปล่อยทิ้ง และเนื่องจากกฎหมายสิ่งแวดล้อมที่เข้มงวดมากขึ้นและมูลค่าของสารลดแรงตึงผิว ทำให้มีความสนใจเพิ่มมากขึ้นในการลดการสูญเสียสารลดแรงตึงผิวไปกับน้ำทิ้ง ในงานวิจัยนี้ได้นำวิธีการทำให้เกิดโฟมแบบลำดับส่วนมาใช้เพื่อนำสารลดแรงตึงผิวกลับมาใช้ใหม่จากสารละลายน้ำ โดยศึกษาทั้งระบบสารลดแรงตึงผิวแบบเดี่ยวและแบบผสม สารลดแรงตึงผิวที่เลือกใช้ในงานวิจัยนี้มี 2 ชนิด คือ ซิลิโคนฟลูออโรคาร์บอน (สารลดแรงตึงผิวชนิดประจุบวก) และ ออกติลฟีนอกซีโพลีอีทอกซีเอธานอล (สารลดแรงตึงผิวชนิดที่ไม่มีประจุ) จากการทดลองพบว่า เมื่ออัตราการไหลของอากาศและสารละลายตั้งต้นลดลง หรือความสูงของโฟมเพิ่มขึ้นจะทำให้อัตราส่วนของสารลดแรงตึงผิวในโฟมเพิ่มขึ้น ความสูงของโฟมในคอลัมน์มีผลกระทบต่อความสามารถในการนำสารลดแรงตึงผิวกลับมาใช้เมื่อเทียบกับอัตราส่วนของสารลดแรงตึงผิวในโฟม ในขณะที่การเปลี่ยนแปลงอัตราการไหลของอากาศและสารละลายตั้งต้น มีผลต่อความสามารถในการนำสารลดแรงตึงผิวกลับมาใช้เป็นอย่างมาก จากการศึกษาการนำสารลดแรงตึงผิวกลับมาใช้ใหม่ในระบบสารลดแรงตึงผิวแบบเดี่ยวพบว่า ค่าความสามารถในการนำสารลดแรงตึงผิวกลับมาใช้และอัตราส่วนของสารลดแรงตึงผิวของสารลดแรงตึงผิวชนิดที่ไม่มีประจุมีค่าสูงกว่าสารลดแรงตึงผิวชนิดที่มีประจุบวก สำหรับระบบสารลดแรงตึงผิวแบบผสมพบว่า สามารถนำสารลดแรงตึงผิวชนิดที่ไม่มีประจุกลับมาใช้ใหม่จากสารละลายน้ำได้ทั้งหมด

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