

**REGENERATION OF t-OCTYLPHENOLPOLYETHOXYLATE  
(TRITON X-114) COACERVATE PHASE BY VACUUM STRIPPING**



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**ABSTRACT**

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In order to make the cloud point extraction (CPE) process economically feasible it is necessary to recover and reuse the surfactant from the effluent stream, which is the coacervate phase solution. This study utilized a bench-scale flash vacuum column to strip out toluene from the t-Octylphenolpolyethoxylate (Triton X-114) coacervate phase. The column used was a differential stripper packed with glass raschig rings and operated under rough vacuum. The Henry's law constant and the partition coefficient of toluene in the surfactant solution were experimentally determined. With a surfactant concentration of 300 mM, the presence of surfactants greatly reduced the Henry's law constant. With co-current flash vacuum stripping at liquid loading rates lower than  $0.29 \text{ cm}^3/\text{cm}^2/\text{min}$  channeling occurred and caused the overall mass transfer coefficient ( $K_x a$ ) to drop with increasing liquid loading rate. Above this liquid loading rate, channeling was eliminated and the effective contact area increased, leading to higher  $K_x a$  values. At pressures greater than 100 torr the effect of pressure on  $K_x a$  was insignificant. However, at lower pressures,  $K_x a$  values increased significantly. The surfactant concentration in the effluent stream remained relatively constant even with changes in liquid loading rate and pressure.

## บทคัดย่อ

พิศิษฐ์ ธนวุฒิวัฒน์ : การแยกทอลูอินจากสารเตตระออกทิลฟีนอลโพลีอิทอกซีเลตที่อยู่ในวัฏภาคโคแอคเซอร์เวท โดยใช้การสตริปปิงภายใต้สูญญากาศ (Regeneration of t-Octylphenolpolyethoxylate (Triton X-114) Coacervate Phase by Vacuum Stripping) อ. ที่ปรึกษา: ศ. ดร. สมชาย โอสุวรรณ, ดร. บุนยรัชต์ กิตยานันท์ และ ศ. ดร. จอห์น สแกมเมอร์ 56 หน้า ISBN 974-17-2272-9

ในงานวิจัยนี้ได้ทำการศึกษาการสตริปปิงทอลูอินจากวัฏภาคโคแอคเซอร์เวท ซึ่งประกอบด้วยสารเตตระออกทิลฟีนอลโพลีอิทอกซีเลตเข้มข้นและทอลูอินภายใต้สูญญากาศ ในคอลัมน์ที่บรรจุด้วยท่อแก้วกลวงขนาดเล็ก นอกจากนั้น งานวิจัยนี้ยังได้ทำการทดลองหาค่าคงที่ของเฮนรี และค่าคงที่สมดุลระหว่างไอกับของเหลวของทอลูอิน ในวัฏภาคโคแอคเซอร์เวทที่มีสารลดแรงตึงผิวเข้มข้น 300 มิลลิโมลาร์ พบว่า สารลดแรงตึงผิวในวัฏภาคโคแอคเซอร์เวท มีผลต่อการลดลงของค่าคงที่ของเฮนรีอย่างมาก สำหรับกระบวนการสตริปปิงเพื่อแยกทอลูอินออกจากวัฏภาคโคแอคเซอร์เวท ภายใต้สูญญากาศแบบต่อเนื่องและไหลทางเดียวกัน พบว่า ที่อัตราการไหลของสารป้อนต่ำกว่า 0.29 ซม./นาทีก การสัมผัสกันของของเหลวและก๊าซยังไม่มีประสิทธิภาพ ทำให้มีพื้นที่การสัมผัสที่ใช้งานจริงน้อย ส่งผลให้สัมประสิทธิ์รวมการถ่ายโอนมวลของระบบลดลง เมื่ออัตราการไหลของสารป้อนเพิ่มขึ้น แต่ที่อัตราการไหลของสารป้อนสูงกว่าค่าดังกล่าว การสัมผัสกันของของเหลวและก๊าซเกิดขึ้น ทำให้พื้นที่การสัมผัสที่ใช้งานจริงเพิ่มขึ้น ส่งผลให้สัมประสิทธิ์รวมการถ่ายโอนมวลของระบบเพิ่มขึ้น และจากการศึกษาผลของความดันในคอลัมน์พบว่าที่ความดันมากกว่า 100 ทอร์ ผลกระทบของความดันต่อสัมประสิทธิ์รวมการถ่ายโอนมวลยังไม่เด่นชัด แต่เมื่อความดันต่ำกว่าค่าดังกล่าว สัมประสิทธิ์รวมการถ่ายโอนมวลจะเพิ่มขึ้นอย่างเห็นได้ชัดเจน สำหรับความเข้มข้นของสารลดแรงตึงผิวในผลิตภัณฑ์ที่ได้จากการสตริปปิงพบว่า ความเข้มข้นของสารลดแรงตึงผิวมีค่าค่อนข้างคงที่ ไม่เปลี่ยนแปลงไปตามอัตราการไหลของสารป้อนและความดันในคอลัมน์

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