

**RHEOLOGY OF CATIONIC SURFACTANT AND FATTY ALCOHOL  
MIXTURES IN THE PRESENCE OF HYDROXYETHYL CELLULOSE**

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for the Degree of Master of Science  
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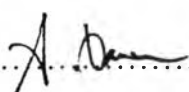
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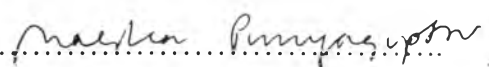
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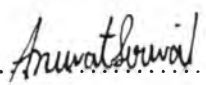
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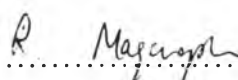
  
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## ABSTRACT

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KEY WORDS : Cetyltrimethyl ammonium chloride/ CTAC/ Fatty Alcohol/  
FA/ Hydroxyethyl Cellulose/ HEC/ Emulsion/ Annealing.

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The rheological and optical properties of CTAC/FA, BTAC/FA, and CTAC/FA/HEC emulsions were studied as a function of aging time and fatty alcohol concentration. The fatty alcohol interacts with the cationic surfactants to form lamellar and vesicle structures. The zero-shear viscosity and entanglement modulus increase with aging time which correlates to a growth in the size of lamellar and vesicular structures. The morphology of the emulsions depends on the type of cationic surfactant, fatty alcohol concentration and the added polymer. In the CTAC/FA system, lamellar aggregate structures are seen while in the CTAC/FA/HEC system, partition of lamellar aggregates are observed. In addition, vesicle and symmetric sunflower-like structures are found in the BTAC/FA system. Experiments were conducted where emulsions were annealed and rheological properties measured as a function of aging time after cooling down. After annealing at 40 °C, the rheological and optical properties remained to their initial values and conditions while they differ only slightly from initial values. At annealing temperatures of 53 and 80 °C, the zero-shear viscosity decreases initially, then returns to its initial value as a function of annealing time. This correlates to a change from lamellar network structures to droplets of FA surrounded with lamellar aggregates. On aging, the lamellar network morphology recovers.

## บทคัดย่อ

ธนภัทร บารมีแสงเพชร : การไหลของสารผสมระหว่างสารลดแรงตึงผิวประเภทประจุบวกและอัลกอฮอล์ชนิดไขมันเมื่อมีไฮดรอกซีเอทิลเซลลูโลส (Rheology of Cationic surfactant and Fatty Alcohol Mixtures in the Presence of Hydroxyethyl Cellulose) อ. ที่ปรึกษา : ศ. ดร. อะเล็กซานเดอร์ เดอร์ เอ็ม เจมสัน (Prof. Alexander M. Jamieson), ดร. มัลลิกา บุญขุปต์ และ รศ. ดร. อนุวัฒน์ ศิริวัฒน์ 112 หน้า ISBN 974-331-939-5

สมบัติการไหลและโครงสร้างของอิมัลชัน CTAC/FA, BTAC/FA, และ CTAC/FA/HEC ถูกศึกษาในเทอมของเวลา (aging time) และความเข้มข้นของอัลกอฮอล์ประเภทไขมัน ซึ่งอัลกอฮอล์ประเภทไขมันจะทำปฏิกิริยากับสารลดแรงตึงผิวประเภทประจุบวกเพื่อเกิดลามেলাและโครงสร้างแบบเวสสิเคิล (vesicle) มีการเพิ่มขึ้นของความหนืดและมอดูลัสสะสม ณ จุดพั่นกันกับเวลาเพราะมีการเพิ่มขนาดของโครงสร้าง รูปร่างลักษณะโครงสร้างของอิมัลชันขึ้นอยู่กับชนิดของสารลดแรงตึงผิวประเภทประจุบวก ความเข้มข้นของอัลกอฮอล์ประเภทไขมัน และพอลิเมอร์ที่เติมลงไปในระบบ CTAC/FA จะมีโครงสร้างแบบลามেলাในขณะที่ระบบ CTAC/FA/HEC จะพบการแยกกันของโครงสร้างแบบลามেলা นอกจากนี้จะพบโครงสร้างแบบเวสสิเคิลและแบบปุ่ม (sunflower like) ด้วย การทดลองนี้ได้ทำการให้ความร้อนแก่อิมัลชันและทำการศึกษาคูณสมบัติการไหลวัดเทียบกับเวลาหลังจากอิมัลชันถูกทำให้เย็นลง ที่การให้ความร้อนอุณหภูมิ 40 องศาเซลเซียส คูณสมบัติการไหลและโครงสร้างจะคงที่ในสภาวะเดิม ในขณะที่การให้ความร้อนที่อุณหภูมิ 53 และ 80 องศาเซลเซียสจะเกิดการเปลี่ยนแปลงโดยค่าความหนืดจะลดลงในช่วงแรกและจะกลับเข้าสู่ค่าเริ่มแรกเมื่อเวลาผ่านไปและจะพบโครงสร้างแบบลามেলাจะเปลี่ยนไปเป็นกลุ่มของอัลกอฮอล์ประเภทไขมันที่ถูกล้อมรอบด้วยโครงสร้างแบบลามেলা

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