

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

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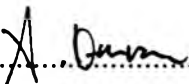
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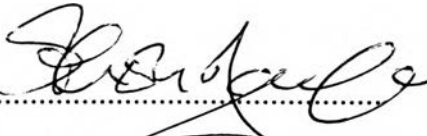
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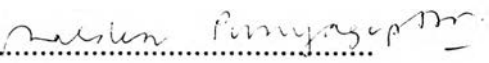
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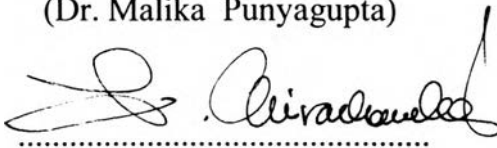

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ABSTRACT

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KEYWORDS : Cetyltrimethyl ammonium chloride/ CTAC/ Fatty Alcohol/ Hydroxyethyl Cellulose/ HEC/ Rheology of emulsion/ Optical microscope/ Laser scanning microscope/ LSM.

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Emulsion structures and rheological properties of CTAC/FA, CTAC/FA/HEC, CTAC/FA/modified HEC and BTAC/FA were investigated in terms of aging time and concentration. Aging allows a growth of lamellar structures toward equilibrium sizes within seven days. Fatty alcohol induces lamellar or vesicle structures, instead of rod-like micelles in the absence of fatty alcohol content. Both entanglement storage modulus and zero shear viscosity increase with fatty alcohol content until reaching a saturation state in which there is an excess fatty alcohol left, as seen by laser scanning micrographs.

The effect of adding HEC to the ternary systems is to disrupt lamellar formation due to interaction between the polymer and the cationic surfactant, inducing polymer chain expansion and surfactant will not be available to stabilize the lamellar structure. This leads to smaller lamellar sizes. On the other hand, the effect of adding modified HEC is to induce the formation of interconnected lamellar structures by the hydrophobic interaction between cetyl branched chain and hydrophobic part of both CTAC and FA. This effect makes the rheological properties such as the storage modulus and viscosity increase with modified HEC concentration.

In the BTAC/FA systems, we found the beautiful and symmetric sunflower-like structures whereas in the CTAC/FA systems we found the aggregates of lamellar and vesicle structures. The differences in structures between these two systems depend on the nature of the cationic surfactant.

บทคัดย่อ

จินตนา นครพานิช : การไหลของสารผสมระหว่างสารลดแรงตึงผิวประเภทประจุบวก และอัลกอฮอล์ชนิดไขมันเมื่อมีไฮดรอกซีเอธิลเซลลูโลส (Rheology of Cationic Surfactant and Fatty Alcohol Mixtures in the presence of Hydroxyethyl Cellulose) อาจารย์ที่ปรึกษา : ศ. อเล็กซ์ซานเดอร์ เอ็ม เจมสัน (Prof. Alexander M. Jamieson), รศ.ดร. อนุวัฒน์ สิริวัฒน์ และ ดร. มัลลิกา บุญยกุลป์ 190 หน้า ISBN 974-638-476-7

โครงสร้างอิมัลชันและสมบัติการไหลของ CTAC/FA, CTAC/FA/HEC, CTAC/FA/modified HEC และ BTAC/FA ถูกศึกษาในเทอมของเวลาของการคงตัว (aging time) ทำให้โครงสร้างลามลลาเติบโตเข้าสู่ขนาดสมดุลในเวลา 7 วัน อัลกอฮอล์ประเภทไขมันเหนี่ยวนำให้ลามลลาหรือโครงสร้างแบบปุ่ม (vesicle structures) มากกว่าที่จะเป็นไมเซลล์แบบแท่ง (rod-like micelle) ทั้งมอดูลัสสะสม ณ จุดพันกัน (entanglement storage modulus) และความหนืดที่แรงเฉือนเป็นศูนย์ (zero shear viscosity) เพิ่มขึ้นเมื่อปริมาณอัลกอฮอล์ประเภทไขมัน (fatty alcohol) เพิ่มขึ้นจนถึงสถานะอิ่มตัว (สถานะที่มีอัลกอฮอล์ประเภทไขมันมากเกินไป) ซึ่งจะเห็นได้ชัดจากภาพถ่ายที่ได้จากการกวาดด้วยแสงเลเซอร์ (laser scanning micrograph) การเติม HEC ลงไปในระบบของผสมจตุภูมิ (ternary system) จะรบกวนการเกิดลามลลาซึ่งเป็นผลจากการเกิดปฏิกิริยาระหว่างพอลิเมอร์กับสารลดแรงตึงผิวประเภทประจุบวก โดยที่สารลดแรงตึงผิวประเภทประจุบวกจะเหนี่ยวนำให้สายโซ่พอลิเมอร์ขยายตัวออกและไม่สามารถทำให้โครงสร้างลามลลาคงตัวอยู่ได้ จึงส่งผลให้ลามลลามีขนาดเล็ก ในทางกลับกัน การเติม modified HEC เหนี่ยวนำให้เกิดการเชื่อมต่อกันระหว่างลามลลา (interconnected) โดยปฏิกิริยาระหว่างสายย่อยซีทิล (cetyl branched chain) กับส่วนที่ไม่ชอบน้ำของทั้ง CTAC และ FA ปรากฏการณ์นี้ทำให้สมบัติการไหล เช่น มอดูลัสสะสมและความหนืดเพิ่มขึ้นเมื่อความเข้มข้นของ modified HEC เพิ่มขึ้น ในระบบที่มี BTAC/FA จะสามารถพบการรวมกันเป็นก้อน (aggregate) ของลามลลาและโครงสร้างแบบปุ่ม ความแตกต่างทางโครงสร้างของสองระบบนี้ขึ้นอยู่กับลักษณะของสารลดแรงตึงผิวประเภทประจุบวก

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