

**CORRELATION OF SURFACTANT ADSORPTION AND WETTABILITY
ON HYDROPHOBIC SURFACES: MIXED CATIONIC AND
NONIONIC SURFACTANTS SYSTEMS**



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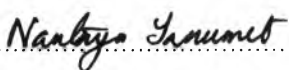
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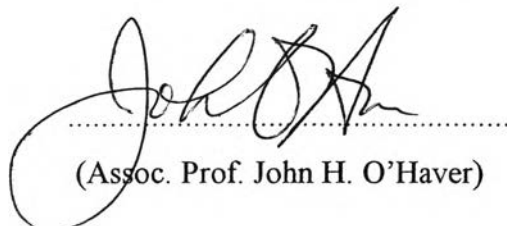
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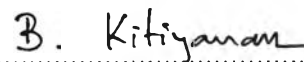

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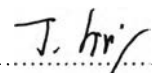
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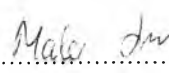

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เบญจวรรณ ทองแผ่ : ความสัมพันธ์ของการดูดซับและการเปียกบนพื้นผิวไฮโดรโฟบิกชนิดต่างๆ ของสารลดแรงตึงผิวแบบผสมระหว่างชนิดประจุบวกและชนิดไร้ประจุ (Correlation of Surfactant Adsorption and Wettability on Hydrophobic Surfaces: Mixed Cationic and Nonionic Surfactant Systems) อ. ที่ปรึกษา : รศ. ดร. สุเมธ ชวเดช, ศ. ดร. จอห์น เอฟ สแกมมัส, รศ. ดร. จอห์น โอ เฮเวอร์ และ ผศ. ดร. บุญยรัชต์ กิตยานันท์ 102 หน้า

งานวิจัยนี้มุ่งศึกษาถึงความสัมพันธ์ระหว่างการดูดซับและการเปียกบนพื้นผิวพลาสติกชนิดต่างๆของสารลดแรงตึงผิวแบบผสมระหว่างชนิดประจุบวกและชนิดไร้ประจุ ภายใต้ความเข้มข้นของสารลดแรงตึงผิวที่ต่างกัน และสัดส่วนเชิงโมลของสารลดแรงตึงผิวชนิดไร้ประจุ 0.25, 0.50 และ 0.75 สารลดแรงตึงผิวที่ใช้ประกอบด้วยสารลดแรงตึงผิวชนิดประจุบวก — CPB และสารลดแรงตึงผิวชนิดไร้ประจุ — OP(EO)₁₀ และพลาสติกที่ใช้ประกอบด้วย โพลีเอทิลีนชนิดความหนาแน่นสูง, โพลีคาร์บอเนต, โพลีไวนิลคลอไรด์, อะคริโลไนไตร บิวตะไดอิน สไตรีน, โพลีเมทิล เมทาคริเลต และ โพลีเอทิลีน เทเรฟทาเลต จากผลการศึกษาพบว่า ปริมาณการดูดซับของสารลดแรงตึงผิวแบบผสมสูงขึ้นตามสัดส่วนเชิงโมลของสารลดแรงตึงผิวชนิดไร้ประจุที่เพิ่มขึ้น ซึ่งการเพิ่มขึ้นของการดูดซับนี้นำไปสู่การปรับปรุงคุณภาพการเปียกบนพื้นผิวอีกด้วย การเติมสารลดแรงตึงผิวชนิดไร้ประจุลงในสารละลาย CPB ช่วยให้สารละลาย CPB ดูดซับบนพื้นผิวได้ดีขึ้น เนื่องจากการลดแรงผลัทางไฟฟ้าระหว่างหัวประจุบวกของสารลดแรงตึงผิวและการเติมสารลดแรงตึงผิวชนิดไร้ประจุลงในสารละลาย CPB ยังส่งผลให้สารลดแรงตึงผิวดูดซับบนพื้นผิวระหว่างของแข็งและของเหลวมากขึ้น แต่อย่างไรก็ตาม ค่าการดูดซับของสารละลาย OP(EO)₁₀ กลับลดลง เมื่อเติมสารละลาย CPB ลงไป เนื่องจากโมเลกุลของ CPB ที่ถูกดูดซับอยู่ก่อนแล้ว เป็นอุปสรรคต่อการดูดซับของสารละลาย OP(EO)₁₀ นอกจากนี้ความเป็นขั้วของพื้นผิวที่สูงขึ้น ยังส่งผลให้คุณสมบัติในการเปียกของพื้นผิวดีขึ้น และสารลดแรงตึงผิวมีแนวโน้มดูดซับบนพื้นผิวระหว่างของเหลวและอากาศ มากกว่าบนพื้นผิวระหว่างของแข็งและอากาศอีกด้วย

ABSTRACT

4971004063: Petrochemical Technology Program

Benchawan Thongpae: Correlation of Surfactant Adsorption and Wettability on Hydrophobic Surfaces: Mixed Cationic and Nonionic Surfactant Systems

Thesis Advisors: Assoc. Prof. Sumaeth Chavadej, Prof. John F. Scamehorn, Assoc. Prof. John O'Haver, and Asst. Prof. Boonyarach Kitiyanan, 102 pp.

Keywords: Cetylpyridinium Bromide (CPB)/ Polyoxyethylene Octyl Phenyl Ether (OP(EO)₁₀)/ Positive Effect/ Electrostatic Repulsion

Adsorption and wetting on different hydrophobic surfaces with aqueous binary mixed solutions of cationic surfactant — cetylpyridinium bromide (CPB), and nonionic surfactant — polyoxyethylene octyl phenyl ether (OP(EO)₁₀) were investigated at molar fractions of the nonionic surfactant of 0.25, 0.50, and 0.75. The six plastics used for this study were high density polyethylene (HDPE), polycarbonate (PC), polyvinylchloride (PVC), acrylonitrile butadiene styrene (ABS), polymethyl methacrylate (PMMA), and polyhexamethylene adipamide (Nylon66). The mixed surfactant systems showed a positive effect in adsorption with increasing molar fraction of nonionic surfactant, leading to wetting improvement. The addition of the nonionic surfactant into the CPB solution increased the CPB adsorption onto the studied plastic surfaces because of the reduction of electrostatic repulsion among cationic head groups and it also increased the surface excess concentration at the solid/liquid interface. Surfactant molecules likely adsorb at the liquid/vapor interface more than at the solid/liquid interface when the polarity of surfaces increased. Interestingly, the masking of negative charge plastic surfaces by the CPB monomeric adsorption obstructed the OP(EO)₁₀ adsorption. In addition, wetting of the studied plastic surfaces was found to increase with increasing polarity of surfaces.

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