

**SURFACTANT ADSORPTION ON PLASTIC SURFACES  
AND ITS RELATION TO WETTING PHENOMENA**



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## บทคัดย่อ

พดุมิพันธ์ สุพลเสรษฐ์: การดูดซับของสารลดแรงตึงผิวบนพื้นผิวพลาสติกและความสัมพันธ์กับปรากฏการณ์การเปียกบนพื้นผิว (Surfactant Adsorption on Plastic Surfaces and Its relation to Wetting Phenomena) อ. ที่ปรึกษา: ผศ. ดร. บุญยรัชต์ กิตียนันท์ และ ศ. จอห์น เอฟ สกามาฮอร์น 58 หน้า ISBN 974-9651-37-5

การเปียกของสารลดแรงตึงผิวบนพื้นผิวของของแข็ง มีบทบาทสำคัญในการประยุกต์ทางพาณิชย์หลายประเภท เช่น การเคลือบพื้นผิว การทำความสะอาด การพิมพ์ ปัจจัยหลักที่มีผลต่อการเปียกคือแรงตึงผิวของสารละลาย อย่างไรก็ตาม การดูดซับของสารลดแรงตึงผิวบนพื้นผิวก็เป็นอีกปัจจัยหนึ่งที่มีความสำคัญ งานวิจัยนี้มุ่งศึกษาถึงความสัมพันธ์ระหว่างการดูดซับของสารลดแรงตึงผิวบนพื้นผิวของพลาสติกและปรากฏการณ์การเปียกบนพื้นผิว ภายใต้ความเข้มข้นของสารลดแรงตึงผิวและอิเล็กโตรไลต์ที่ต่างกัน สารลดแรงตึงผิวที่ใช้ประกอบไปด้วย NaOBS CPC และ Triton X-114 และพลาสติกที่ใช้ประกอบด้วยโพลีเอทิลีนชนิดความหนาแน่นสูง โพลีสไตรีน และ โพลีเอทิลีนเทอแรพทาเรท ผลการศึกษาพบว่า แรงตึงผิวระหว่างของแข็งและของเหลวลดลงตามปริมาณการดูดซับของสารลดแรงตึงผิวที่เพิ่มขึ้น สารลดแรงตึงผิวจึงมีความสามารถที่จะลดทั้งแรงตึงผิวของสารละลาย และแรงตึงผิวระหว่างของแข็งและของเหลว ซึ่งทำให้ความสามารถในการเปียกพื้นผิวของสารละลายสารลดแรงตึงผิวนั้นมีมากขึ้น ในกรณีของโพลีสไตรีน และ โพลีเอทิลีนเทอแรพทาเรท นั้นพบว่าการเติมเกลือมีผลทำให้ความสามารถในการเปียกของสารละลาย CPC ลดลง เมื่อเทียบกับสารละลาย CPC ที่มีค่าแรงตึงผิวเท่ากัน ปรากฏการณ์นี้อาจเกิดจากลักษณะที่ต่างกันของพื้นผิวของแข็ง/ของเหลว เมื่อเทียบกับพื้นผิวของของเหลว/อากาศ ซึ่งส่งผลให้โมเลกุลของ CPC ดูดซับบนพื้นผิวในลักษณะที่ต่างกัน แต่ผลการทดลองนี้ ไม่เกิดขึ้นกับกรณีของ NaOBS ซึ่งอาจเป็นผลมาจากความยาวของส่วนหางของสารลดแรงตึงผิวที่ต่างกัน

## ABSTRACT

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Keywords: Surfactant Adsorption/ Plastic/ Hydrophobic Surface/ Adsorption  
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Wetting of solids by aqueous surfactant is important for many commercial applications such as coatings, detergency, and printing. The surface tension of solution is usually considered as a main factor in wetting, whereas the adsorption of surfactant onto solid/liquid interface is generally ignored. In this work, the adsorption isotherm and contact angle measurement of three representative surfactants : sodium Octyl benzene sulfonate (NaOBS), cetylpyridinium chloride (CPC) and polyoxyethylene octyl phenyl ether (Triton X-100) on high-density polyethylene (HDPE), polystyrene (PS) and polyethyleneterephthalate (PET) were conducted as a function of surfactant concentration and salinity. For all cases, the solid/liquid interfacial tension ( $\gamma_{SL}$ ) decreased with surfactant concentration. Together with the adsorption isotherm,  $\gamma_{SL}$  was also observed to decrease with surfactant adsorption on plastic. Surfactant decreased not only the liquid surface tension ( $\gamma_{LV}$ ) but also  $\gamma_{SL}$ . The reduction in both interfacial tension resulted in lower value of contact angle. In case of PS and PET, the presence of NaCl hindered the ability to reduce the contact angle of CPC solution that has the same  $\gamma_{LV}$ . The possible reason is the difference in the nature of solid/liquid interface and liquid/air interface, which caused CPC to differently distribute among the two interfaces. However, this effect was not observed for NaOBS, possibly due to the difference in the length of hydrophobic tail of CPC and NaOBS.

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