

**COMPETITIVE SURFACTANT ADSORPTION OF AOT AND TWEEN 20 ON  
GOLD USING QUARTZ CRYSTAL MICROBALANCE WITH DISSIPATION**

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A Thesis Submitted in Partial Fulfilment of the Requirements  
for the Degree of Master of Science  
The Petroleum and Petrochemical College, Chulalongkorn University  
in Academic Partnership with  
The University of Michigan, The University of Oklahoma,  
Case Western Reserve University, and Institut Français du Pétrole  
2014


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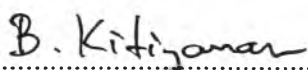
**Thesis Title:** Competitive Surfactant Adsorption of AOT and TWEEN 20 on Gold Using Quartz Crystal Microbalance with Dissipation  
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**Program:** Petrochemical Technology  
**Thesis Advisors:** Asst. Prof. Boonyarach Kitiyanan  
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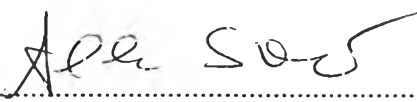
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Accepted by The Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.

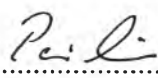
  
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## ABSTRACT

5571003063: Petrochemical Technology Program

Jakkrit Thavorn: Competitive Surfactant Adsorption of AOT and TWEEN 20 on Gold Using Quartz Crystal Microbalance with Dissipation.

Thesis Advisors: Asst. Prof. Boonyarach Kitiyanan, and Prof. Alberto Striolo, 71 pp.

Keywords: AOT/ Tween 20/ Surfactant adsorption/ QCM-D/ Gold

Competitive surfactant adsorption of the anionic surfactant AOT and the nonionic surfactant Tween 20 on gold surface was investigated by using the quartz crystal microbalance with dissipation (QCM-D) at 25 °C. The adsorption isotherm of pure AOT did not reach a plateau at the CMC, but rather adsorption continued to gradually increase at concentrations higher than the CMC before reaching a plateau. This behavior is evidence of competitive adsorption between AOT and impurities. The adsorbed layer of AOT on gold became more viscoelastic as the concentration of AOT increased. Tween 20 reached the maximum adsorption on gold before its concentration reached the CMC, suggesting that the attraction between Tween 20 and gold is very strong. The Tween 20 adsorbed layer was also rigid, when compared to the AOT adsorbed layer, as indicated by low dissipation. The addition of Tween 20 to a surface covered by AOT resulted in an increase in adsorbed mass as determined by the QCM signal, suggestive of insertion of Tween 20 into the AOT adsorbed layer. This phenomenon is expected since Tween 20 will be able to separate the repulsive headgroups of AOT. However, some desorption was found for a pre-adsorbed Tween 20 layer when AOT is added. The interpretation is that some of the Tween 20 on gold was pulled by AOT to form mixed micelles in solution. Although a two-step model was applied to both AOT and Tween 20 adsorption kinetic data, AOT was found to adsorb much more slowly than Tween 20.

## บทคัดย่อ

จักรกฤษณ์ ถาวร: การแข่งขันการดูดซับของสารลดแรงตึงผิวเอโอทีและทวิน 20 บนผิวทองโดยใช้เครื่องควอทซ์ คริสตัล ไมโครบาลานซ์ (Competitive Surfactant Adsorption of AOT and TWEEN 20 on Gold Using Quartz Crystal Microbalance with Dissipation)  
 อาจารย์ที่ปรึกษา: ผศ. ดร. บรมยรรชต์ กิตยानันท์, ศ. ดร. อัลเบอร์โต้ สตรีโอโล 71 หน้า

การศึกษากการแข่งขันการดูดซับของสารลดแรงตึงผิวชนิดประจุลบ เอโอที (AOT) และชนิดไม่มีประจุ (Tween 20) บนผิวทองโดยใช้เครื่อง ควอทซ์ คริสตัล ไมโครบาลานซ์ ที่อุณหภูมิ 25 องศาเซลเซียส ไอโซเทอมของการดูดซับของเอโอที ไม่ได้คงที่ที่ความเข้มข้นวิกฤตของการเกิดไมเซลล์ (CMC) แต่มีแนวโน้มเพิ่มขึ้นเรื่อยๆ ตามความเข้มข้นที่ขึ้น ก่อนที่เส้นกราฟจะคงที่ หลังจากความเข้มข้นวิกฤตของการเกิดไมเซลล์ พฤติกรรมนี้แสดงถึงการแข่งขันกันระหว่างเอโอทีและสิ่งเจือปนในสารละลาย โครงสร้างของเอโอทีบนผิวทองมีความยืดหยุ่นมากขึ้นเรื่อยๆ ตามความเข้มข้นของสารละลายเอโอทีที่เพิ่มขึ้น การดูดซับของทวิน 20 บนผิวทองถึงจุดอิ่มตัวก่อนค่าความเข้มข้นวิกฤตของการเกิดไมเซลล์ เพราะแรงดึงดูดระหว่างทวิน 20 กับทองมีความแข็งแรง โดยที่โครงสร้างของทวิน 20 บนผิวทองมีความแข็งแรงมากกว่าโครงสร้างของเอโอที การดูดซับของทวิน 20 บนผิวทองที่ถูกปกคลุมด้วยเอโอที นำไปสู่การเพิ่มขึ้นของมวลรวมบนผิวทองเนื่องจากการแทรกตัวของทวิน 20 ลงในชั้นโครงสร้างของเอโอที ปรากฏการณ์นี้เกิดขึ้นได้เพราะทวิน 20 สามารถลดแรงผลักระหว่างประจุส่วนหัวของเอโอที อย่างไรก็ตามการคลายตัวของทวิน 20 ที่ถูกปกคลุมอยู่บนผิวทองนั้นเกิดขึ้นเมื่อสารละลายเอโอทีถูกเติมเข้าในระบบ โดยที่ทวิน 20 ถูกดึงออกจากผิวทองโดยเอโอทีเพื่อไปสร้างไมเซลล์ผสมระหว่างเอโอทีและทวิน 20 ในสารละลาย ข้อมูลด้านความเร็วในการดูดซับของเอโอทีและทวิน 20 บนผิวทองถูกคำนวณโดยสมการการดูดซับแบบ 2 ชั้น โดยความเร็วในการดูดซับของเอโอทีช้ามากเมื่อเปรียบเทียบกับทวิน

## ACKNOWLEDGEMENTS

Coming to The University of Oklahoma (OU) in USA as a part of the student exchange program for my master thesis during my 2<sup>nd</sup> year at The Petroleum and Petrochemical College (PPC), Chulalongkorn University, Thailand was the beginning of a life-changing experience. It was not only getting used to leaving far away from family and friends, but also adjusting to a new culture. Although not an easy process, I recall it as one of the best experience in my life.

This research project would not have been possible without the support of many people. First, the author wishes to express my profound gratitude and deep regards to my advisor, Asst. Prof. Boonyarach Kitiyanan, and my co-advisor, Prof. Alberto Striolo, who are abundantly helpful and offered invaluable assistance, support and guidance. Deepest gratitude is also due to the members of the supervisory committee, Prof. Sumaeth Chavadej and Asst. Prof. Pailin Ngaotrakanwiwat. If the author is without whose knowledge and assistance, this study will not have been successful.

In addition, the author would like to convey thanks to The Petroleum and Petrochemicals College, Chulalongkorn University, Thailand and The Center of Excellence on Petrochemical and Materials Technology, Thailand for providing the fund and laboratory facilities. Furthermore, The Institute of Applied Surfactant Research at the University of Oklahoma, USA was also acknowledged. Special thanks go to Dr. Matthew Dixon from Biolin Scientific for fruitful help and discussion for using Q-tool software. Thank you Mr. Joshua J. Hamon for instrument training, Ms. Manaswee Suttipong and other students in Prof. Striolo's group for helping me at the beginning of my life in USA, and all my PPC friends for creative encouragement.

Last but not least, the author wishes to express my love and gratitude to my families for their understanding and cheerfulness, through the duration of my studies.

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