

**ENHANCEMENT OF ANAEROBIC DIGESTION OF CELLULOSIC  
FRACTION IN WASTEWATER BY MICROAERATION**

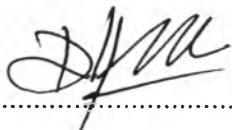
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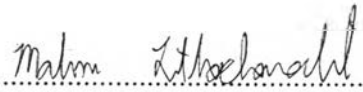
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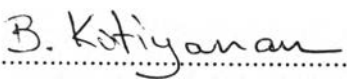
  
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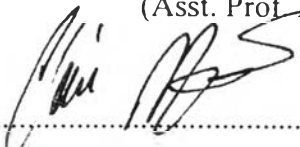
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## ABSTRACT

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Oijai Khongsumran: Enhancement of Anaerobic Digestion of Cellulosic Fraction in Wastewater by Microaeration.

Thesis Advisors: Assoc. Prof. Pramoch Rangsunvigit, Prof. Sumaeth Chavadej, and Dr. Malinee Leethochawalit 89 pp.

Keywords: Anaerobic digestion/ Cassava residue/ Microaeration/ Cassava wastewater/ Continuous stirred tank reactor

Effects of microaeration on the anaerobic digestion of cassava wastewater with added cassava residue in the continuous stirred tank reactor (CSTR) system without temperature and pH control were studied. The results indicated that with the optimum COD loading rate of  $1.710 \text{ kg/m}^3 \text{ d}$ , the generated gas was mainly composed of  $\text{CH}_4$  (74.42 %) and  $\text{CO}_2$  (18.43 %). The addition of 1,000 ppm of cassava residue resulted in a total optimum COD loading rate of  $1.884 \text{ kg/m}^3 \text{ d}$ . The produced gas had higher  $\text{CH}_4$  and  $\text{CO}_2$ , 80.09 % and 12.84 %, respectively. The oxygen supply increased the  $\text{CH}_4$  composition to 82.25 %. Therefore, it may be explained that the addition of cassava residue resulted in the increase in the organic compounds available for the anaerobic bacteria to degrade consistence with increase the methane production rate. Besides, the oxygen supply rate of  $3.0 \text{ mL O}_2/\text{L}_R \text{ d}$  was considered to be the optimum microaerobic condition that was suitable for the anaerobic bacteria growth. The microaeration not only provided the high methane yield but also resulted in the high efficiency of desulphurization of the produced biogas including the high hydrolysis efficiency in accordance with the high degradation of cassava residue.

## บทคัดย่อ

อ้อยใจ คงสำราญ : การเพิ่มประสิทธิภาพของกระบวนการย่อยสลายแบบไร้อากาศในการผลิตก๊าซชีวภาพจากน้ำเสียกากมันด้วยวิธีเติมอากาศแบบปริมาณที่น้อยและจำกัด (Enhancement of Anaerobic Digestion of Cellulosic Fraction in Wastewater by Microaeration) อาจารย์ที่ปรึกษา : รศ. ดร. ปราโมช รังสรรค์วิจิตร, ศ. ดร. สุเมธ ชวเดช, และ ดร. มาลินี ลีโทชวลิต 89 หน้า

งานวิจัยนี้ได้ทำการศึกษาผลของการเติมอากาศแบบปริมาณที่น้อยและจำกัดต่อกระบวนการย่อยสลายแบบไร้อากาศในการผลิตก๊าซชีวภาพจากน้ำเสียกากมันสำปะหลัง โดยการใช้อยู่ปฏิบัติการแบบกวนผสม (ซีเอสทีอาร์) ภายใต้สภาวะที่ไม่มีการควบคุมอุณหภูมิและค่าความเป็นกรดต่าง จากผลการทดลองพบว่า ที่อัตราการป้อนสารอินทรีย์ที่เหมาะสม 1.710 กิโลกรัมต่อลูกบาศก์เมตรต่อวัน ก๊าซชีวภาพที่ผลิตได้ประกอบด้วยก๊าซมีเทน 74.42 เปอร์เซ็นต์ และก๊าซคาร์บอนไดออกไซด์ 18.43 เปอร์เซ็นต์เป็นหลัก ซึ่งเมื่อมีการเติมกากมันสำปะหลังลงไปในน้ำเสียปริมาณ 1,000 มิลลิกรัมต่อลิตร มีผลทำให้ที่อัตราการป้อนสารอินทรีย์ที่เหมาะสม 1.884 กิโลกรัมต่อลูกบาศก์เมตรต่อวัน สามารถผลิตก๊าซชีวภาพที่ประกอบด้วยก๊าซมีเทนในปริมาณที่สูงขึ้น 80.09 เปอร์เซ็นต์ และก๊าซคาร์บอนไดออกไซด์ 12.84 เปอร์เซ็นต์ อีกทั้งภายใต้อัตราการป้อนก๊าซออกซิเจนที่เหมาะสม 3.0 มิลลิกรัมต่อลิตรของถังปฏิบัติการต่อวัน ส่งผลทำให้เพิ่มประสิทธิภาพของกระบวนการไฮโดรไลซิส ทำให้ช่วยการเพิ่มก๊าซมีเทนเป็น 82.25 เปอร์เซ็นต์ ในองค์ประกอบหลักของก๊าซชีวภาพ รวมถึงเพิ่มประสิทธิภาพในการกำจัดก๊าซไฮโดรเจนซัลไฟด์และการย่อยสลายของกากมันในส่วนขององค์ประกอบเซลล์ลูโลสที่สูง 62.57 เปอร์เซ็นต์ อีกด้วย

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