


**SYNTHESIS OF HIGH SURFACE AREA TIN OXIDE VIA SOL-GEL
PROCESS USING TIN GLYCOLATE PRECURSOR**

Chabaiorn Junin

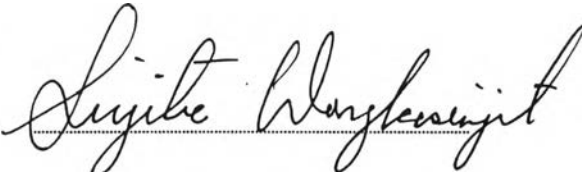
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By: Chabaiporn Junin
Program: Polymer Science
Thesis Advisors: Associate Professor Sujitra Wongkasemjit
Professor Alexander Jamieson


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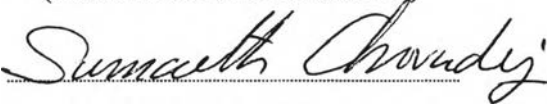

..... College Director
(Assoc. Prof. Nantaya Yanumet)

Thesis Committee:


.....
(Assoc. Prof. Sujitra Wongkasemjit)


.....
(Prof. Alexander M. Jamieson)


.....
(Assoc. Prof. Anuvat Sirivat)


.....
(Assoc. Prof. Sumaeth Chavadej)

ABSTRACT

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Chabaiporn Junin: Synthesis of High Surface Area Tin Oxide via

Sol-gel Process Using Tin Glycolate Precursor

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High surface area tin oxide was prepared via sol-gel process from the moisture stable tin glycolate precursor, synthesized directly from commercially available tin oxide and ethylene glycol via the oxide one-pot synthesis (OOPS) process using triethylenetetramine as base catalyst. The precursor was dissolved in 8 M HNO_3 at various $\text{HNO}_3/\text{H}_2\text{O}$ ratios to form gels at room temperature. The effect of calcination time, calcination temperature, $\text{HNO}_3/\text{H}_2\text{O}$ ratios and calcination heating rate were investigated. The structure of the obtained tin oxide was characterized using SEM, XRD and BET. The highest specific surface area tin oxide obtained was $510 \text{ m}^2/\text{g}$ at the $\text{HNO}_3:\text{H}_2\text{O}$ ratio of 0.4, the calcination temperature and rate of 300°C and $0.5^\circ\text{C}/\text{min}$, respectively. Surface area of tin oxide products was decreased as increasing in the calcination temperature and the $\text{HNO}_3/\text{H}_2\text{O}$ ratios while the crystallinity was undoubtedly increased.

บทคัดย่อ

ชไบพร จันทรอินทร์: การสังเคราะห์ดีบุกออกไซด์ที่มีพื้นที่ผิวสูงโดยใช้ดีบุกไกลโคเลตเป็นสารตั้งต้นโดยผ่านกระบวนการโซล-เจล (Synthesis of High Surface Area Tin Oxide via Sol-gel Process Using Tin Glycolate Precursor) อ. ที่ปรึกษา: ศาตราจารย์ อเล็กซานเดอร์ เอ็ม.เจมิสัน และ รศ. ดร. สุจิตรา วงศ์เกษมจิตต์ 49 หน้า ISBN 974-993-712-0

ดีบุกออกไซด์ที่มีพื้นที่ผิวมากถูกเตรียมผ่านกระบวนการโซลเจลจากสารตั้งต้นดีบุกไกลโคเลตที่มีความเสถียรต่อความชื้นซึ่งสังเคราะห์ขึ้นจากดีบุกออกไซด์และเอธิลีนไกลคอลโดยใช้ปฏิกิริยาขั้นตอนเดียวที่เรียกว่า Oxide One Pot Synthesis (OOPS) และใช้เบสไตรเอธิลีนเตตระมีนเป็นตัวเร่งปฏิกิริยา จากการนำดีบุกไกลโคเลตที่เป็นสารตั้งต้นไปละลายด้วยกรดไนตริกที่สัดส่วนของกรดต่อน้ำต่างกันพบว่าสามารถเกิดเจลที่อุณหภูมิห้อง แล้วนำไปศึกษาผลของเวลาและอุณหภูมิที่ใช้ในการเผา อัตราส่วนของกรดต่อน้ำ และอัตราการให้ความร้อนที่ใช้ในการเผา

ดีบุกออกไซด์ที่ผลิตผ่านกระบวนการโซลเจลนี้มีพื้นที่สูงถึง 510 ตารางเมตรต่อกรัมที่สถานะ อัตราส่วนของกรดต่อน้ำ 0.4 อุณหภูมิที่ใช้ในการเผา 300 องศาเซลเซียสและอัตราการให้ความร้อน 0.5 องศาเซลเซียสต่อนาที จากการศึกษาพบว่าพื้นที่ผิวของดีบุกออกไซด์ที่ผลิตได้จะลดลงเมื่อเพิ่มอุณหภูมิในการเผาและอัตราส่วนของกรดต่อน้ำในขณะที่ความเป็นผลึกจะเพิ่มขึ้น

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