

**MCM-48-POLYBENZOXAZINE MIXED MATRIX MEMBRANES FOR  
CH<sub>4</sub>/CO<sub>2</sub> SEPARATION**

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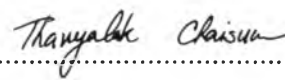
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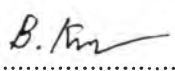
  
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## ABSTRACT

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Mesoporous MCM-48 was synthesized from silatrane via sol–gel process and mixed with polybenzoxazine (PBZ) to fabricate mixed-matrix membranes (MMMs) for gas separation. The performance of the membranes was investigated as a function of filler loading. The permeance of CH<sub>4</sub> and CO<sub>2</sub> increased with increasing MCM-48 loading was more strongly affected by the gas diffusivity than by the gas solubility. The selectivity had a maximum at 10 wt% loading that related to the good interaction between MCM-48 and PBZ matrix and that the MMM was defect free, as indicated in the characterization done by SEM, ATR-FTIR and DSC.

## บทคัดย่อ

นักธีววรรณ กิตติศรีณย์เลิศ : การใช้แผ่นเยื่อบางผสมของ MCM-48 และพอลิเบนซอกซาซีนในการแยกก๊าซมีเทนและก๊าซคาร์บอนไดออกไซด์ (MCM-48-Polybenzoxazine Mixed Matrix Membranes for CH<sub>4</sub>/CO<sub>2</sub> Separation) อ.ที่ปรึกษา: รองศาสตราจารย์ ดร.สุจิตรา วงศ์เกษมจิตต์ และ ผู้ช่วยศาสตราจารย์ ดร.ธัญญลักษณ์ ฉายสุวรรณ 47 หน้า

MCM-48 ที่มีรูพรุนขนาดเมโซถูกสังเคราะห์ขึ้นจาก silatrane ด้วยกระบวนการโซล-เจล และนำมาผสมกับพอลิเบนซอกซาซีนเพื่อเตรียมแผ่นเยื่อบางผสมสำหรับแยกก๊าซมีเทนออกจากก๊าซคาร์บอนไดออกไซด์ ประสิทธิภาพของเมมเบรนศึกษาจากการเปลี่ยนแปลงปริมาณของฟิลเลอร์ที่เติมลงไป จากการทดลองพบว่า การซึมผ่านของก๊าซมีเทนและก๊าซคาร์บอนไดออกไซด์ มีค่าเพิ่มขึ้นเมื่อเพิ่มปริมาณของ MCM-48 ในเมมเบรน ซึ่งเป็นผลมาจากการแพร่ของก๊าซมากกว่า การละลายของก๊าซ ขณะที่ความสามารถในการเลือกผ่านก๊าซมีค่ามากที่สุดเมื่อปริมาณของ MCM-48 เพิ่มขึ้นเท่ากับ 10 เปอร์เซ็นต์โดยน้ำหนัก ซึ่งอธิบายได้จากการเกิดแรงดึงดูดที่ดีระหว่าง MCM-48 และพอลิเบนซอกซาซีนเมทริกซ์ และการไม่เกิดรอยแยกของเมมเบรน ซึ่งสามารถพิสูจน์โดยใช้เครื่อง SEM, ATR-FTIR และ DSC

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**ABBREVIATIONS**

$^1\text{H}$ NMR	Proton nuclear magnetic resonance spectroscopy
ATR-IR	Attenuated total reflectance infrared spectroscopy
DSC	Differential scanning calorimetry
FT-IR	Fourier transform infrared spectrometer
MMM	Mixed matrix membrane
PBZ	Polybenzoxazine
SAA	Surface area analysis
SEM	Scanning electron microscopy
TGA	Thermogravimetric analysis