

**MODIFICATION OF COMMERCIALY AVAILABLE ADSORBENTS FOR
CO₂ SELECTIVE ADSORPTION**



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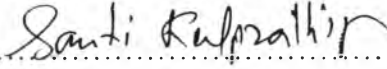
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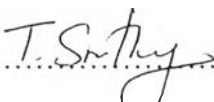
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ABSTRACT

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To reduce the carbon dioxide emission into the atmosphere, adsorption is believed to be one of the most attractive methods for post-combustion treatment of flue gas. In this work, activated carbon was modified by monoisopropanolamine (MIPA), a primary amine, N-methylethanolamine (NMEA), a secondary amine, piperazine, and K₂CO₃ via impregnation in order to enhance CO₂ adsorption capacity. The amounts of each amine loading were varied from 10 to 30 wt% in methanol and in water for K₂CO₃. The adsorption was carried out at a temperature ranging from 30 to 75 °C and four different gas pressures up to 1 atm. The adsorbents were characterized by TGA and BET to study their characteristics. The introduction of amine has a significant effect on the surface area and pore volume. The surface area and pore volume decreased with the increased in the amount of the amine loading. Effectiveness of the adsorbents on the CO₂ adsorption including CO₂ adsorption capacity and adsorption temperature was also investigated. At 50°C and 1 atm, the modified adsorbents showed higher adsorption capacity than the unmodified carbon. The carbon loaded with piperazine gave the highest CO₂ adsorption capacity.

บทคัดย่อ

ดาวพัฒนา พิชัยชาญเลิศ : การปรับปรุงพื้นผิวของสารดูดซับเพื่อเพิ่มประสิทธิภาพในการดูดซับก๊าซคาร์บอนไดออกไซด์ (Modification of Commercially Available Adsorbents for CO₂ Selective Adsorption) อ. ที่ปรึกษา : รศ. ดร. ปราโมช รังสรรค์วิจิตร และ ดร. สันติ กุลประทีปปัญญา 47 หน้า

ในปัจจุบันการดูดซับเป็นวิธีที่ได้รับการยอมรับอย่างกว้างขวางในการกำจัดก๊าซคาร์บอนไดออกไซด์จากไอก๊าซเสียที่ปล่อยออกมาจากโรงงานอุตสาหกรรม งานวิจัยนี้ ใช้โมโนไอโซโพรพานอลเอมีน เมทิลเออร์ทาโนเอมีน ไพเพอราซีน และ โปแทสเซียมคาร์บอเนต เคลือบบนผิวของถ่านกัมมันต์ โดยวิธีอิมเพกเนชัน เพื่อเพิ่มความสามารถในการดูดซับก๊าซคาร์บอนไดออกไซด์ ปริมาณของเอมีนที่ใช้อยู่ระหว่าง 10 ถึง 30 เปอร์เซ็นต์ ในเมทานอล และในน้ำสำหรับโปแทสเซียมคาร์บอเนต อุณหภูมิที่ใช้ในการดูดซับอยู่ในช่วง 30 ถึง 75 องศาเซลเซียส และ ปรับความดันที่ช่วงจนถึง 1 บรรยากาศ นอกจากนั้นได้ศึกษาการเปลี่ยนแปลงน้ำหนักของสารและวิเคราะห์พื้นที่ผิว จากการศึกษาพบว่า การใส่เอมีนทำให้พื้นที่ผิวและปริมาตรรูพรุนของสารดูดซับลดลงอย่างมาก และยิ่งลดลงมากขึ้นเมื่อปริมาณเอมีนเพิ่มขึ้น ผลการศึกษาประสิทธิภาพของสารดูดซับ ที่อุณหภูมิ 50 องศาเซลเซียส และ 1 บรรยากาศ พบว่าสารดูดซับที่ผ่านการปรับปรุงแล้วให้ผลในการดูดซับที่ดีกว่าถ่านกัมมันต์ และสารดูดซับที่ได้รับการปรับปรุงโดยไพเพอราซีนให้ค่าประสิทธิภาพการดูดซับดีที่สุด

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TABLE OF CONTENTS

	PAGE
Title Page	i
Abstract (in English)	iii
Abstract (in Thai)	iv
Acknowledgement	v
Table of Contents	vi
List of Tables	ix
List of Figures	xi
 CHAPTER	
I INTRODUCTION	1
 II LITERATURE REVIEW	
2.1 Carbon Dioxide	3
2.2 Carbon Dioxide Capture and Separation	5
2.2.1 Absorption	7
2.2.2 Membrane Separation	8
2.3 Adsorption	8
2.4 Adsorbent	11
2.4.1 Activated Carbon	12
2.4.2 Silica Gel	14
2.4.3 Zeolites	15
2.4.3 Mesoporous Silicates	17
 III EXPERIMENTAL	
3.1 Materials and Chemicals	21
3.2 Experimental Procedures	21
3.2.1 Impregnation	21
3.2.2 Characteristics of Adsorbent	21
3.2.3 Adsorption Measurement	22

CHAPTER	PAGE
IV RESULTS AND DISCUSSION	24
4.1 Characterization	24
4.2 CO ₂ Adsorption	
4.2.1 Effect of Temperature	30
4.2.2 Effect of Loading	36
4.2.3 Regeneration	41
V CONCLUSIONS AND RECOMMENDATIONS	42
REFERENCES	43
CIRRICULUM VITAE	47

LIST OF TABLES

TABLE		PAGE
2.1	Properties of carbon dioxide	3
2.2	Flue gas composition	4
2.3	Fuels-exhaust temperature	5
2.4	Differences between chemisorption and physisorption	9
2.5	Summary of factors governing choice of regeneration method	11
2.6	Pore sizes in typical activated carbon	13
2.7	Properties of commercial silica gel	15
4.1	Surface area and pore volume analysis of adsorbents	24

LIST OF FIGURES

FIGURE	PAGE
2.1 Post-combustion process	6
2.2 Pre-combustion process	6
2.3 Oxy-fuel combustion process	7
2.4 Activated carbon adsorbs gases and chemicals	13
2.5 Structure of zeolite	15
2.6 Carbon dioxide reaction pathway with monoamine-grafted on mesoporous silica	19
2.7 Carbon dioxide reaction pathway with di-amine-grafted on mesoporous silica	19
2.8 Carbon dioxide reaction pathway with tri-amine-grafted on mesoporous Silica	20
3.1 Schematic of the experiment	22
4.1 TGA profiles of activated carbon	25
4.2 TGA profiles of activated carbon and modified activated carbon with MIPA	26
4.3 TGA profiles of activated carbon and modified activated carbon with NMEA	27
4.4 TGA profiles of activated carbon and modified activated carbon with piperazine	28
4.5 TGA profile of activated carbon and modified activated carbon with K_2CO_3	29
4.6 CO_2 adsorption isotherms of unmodified activated carbon and activated carbon modified with 10% piperazine, MIPA, NMEA, and K_2CO_3 at 30°C	31
4.7 CO_2 adsorption isotherms of unmodified activated carbon and activated carbon modified with 30% piperazine, MIPA, NMEA, and K_2CO_3 at 30°C	31

FIGURE	PAGE
4.8 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10% piperazine, MIPA, NMEA, and K ₂ CO ₃ at 50°C	32
4.9 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10% piperazine, MIPA, NMEA, and K ₂ CO ₃ at 75°C	33
4.10 CO ₂ adsorption isotherms of unmodified activated carbon at 30, 50, and 75°C	34
4.11 CO ₂ adsorption isotherms of modified activated carbon with 10% K ₂ CO ₃ at 30, 50, and 75°C	34
4.12 CO ₂ adsorption isotherms of modified activated carbon with 10% piperazine at 30, 50, and 75°C	35
4.13 CO ₂ adsorption isotherms of modified activated carbon with 10% MIPA at 30, 50, and 75°C	35
4.14 CO ₂ adsorption isotherms of modified activated carbon with 10% NMEA at 30, 50, and 75°C	36
4.15 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% piperazine at 50°C	37
4.16 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% piperazine at 75°C	38
4.17 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% MIPA at 50°C	38
4.18 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% MIPA at 75°C	39
4.19 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% K ₂ CO ₃ at 30°C	40

FIGURE	PAGE
4.20 CO ₂ adsorption isotherms of unmodified activated carbon and activated carbon modified with 10 and 30% K ₂ CO ₃ at 50°C	40
4.21 CO ₂ adsorption isotherms of the modified activated carbon with 10% piperazine and the regenerated activated carbon modified with 10% piperazine at 50°C.	41