

**CATALYTIC PYROLYSIS OF WASTE TIRE OVER
KL-BASED CATALYSTS: DOUBLE BEDS OF KL AND Y ZEOLITES**



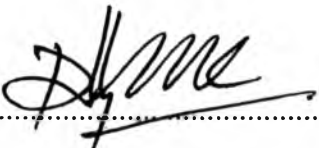
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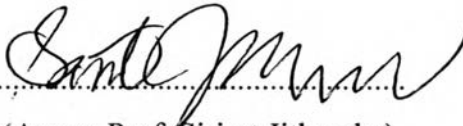
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By: Mullika Phopaisarn
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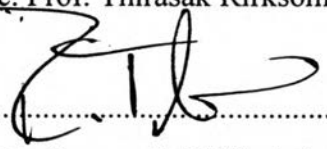
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ABSTRACT

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Catalysts can assist in waste tire pyrolysis for the production of valuable products. A new type of acid-base catalysts can play an important role on modifying the product yields and the compositions of hydrocarbon products. Therefore, the advantages of high isomerization (KL), aromatization (Pt/KL), and ring opening (Pt/Y) activities could be simultaneously taken by using a combination of these catalysts in a pyrolysis reactor. The influence of the catalyst mixing between acid (Y) and basic (KL) zeolites and the packing sequence in the reactor were studied with the expectation of producing molecules of higher valuable products. The ratio of the two zeolites was varied from 0.25 to 1.0 with a fixed 1% wt of Pt loaded by using incipient wetness impregnation. From the results, it was clear that the yields of light olefins and cooking gas obtained from the physical mixtures (Y + KL) were higher than those of the catalytic pyrolysis with the pure zeolites. Especially, the mixture at the $\phi_{KL} = 0.25$ gave the highest activity on light olefins and cooking gas production. Moreover, it was found that Pt/KL packed in the first layer with Pt/Y on the second layer at $\phi_{Pt/KL} = 0.25$ produced the highest saturated hydrocarbon content; thus, this combination can be considered to be a promising catalyst for gas oil production. Furthermore, the single Pt/KL bed gave the highest aromatic content in the maltenes fraction. Therefore, the octane number of its oil is expected to be highly improved.

บทคัดย่อ

นางสาวมลลิกา เผ่าไพศาล: กระบวนการไพโรไลซิสยางรถยนต์หมดสภาพด้วยตัวเร่งปฏิกิริยาซีโอไลต์ชนิดเคแอล: การเรียงของซีโอไลต์ชนิดเคแอลและซีโอไลต์ชนิดววย (Catalytic pyrolysis of waste tire over KL-based catalysts: double beds of KL and Y zeolites) อ. ที่ปรึกษา: รศ. ดร. ศิริรัตน์ จิตการคำ 132 หน้า

ในปัจจุบันตัวเร่งปฏิกิริยาสามารถช่วยในการปรับปรุงผลิตภัณฑ์ที่มีคุณค่าในกระบวนการไพโรไลซิสของยาง โดยตัวเร่งปฏิกิริยากรด-เบสชนิดใหม่มีบทบาทสำคัญในการปรับเปลี่ยนปริมาณและองค์ประกอบของสารประกอบไฮโดรคาร์บอนในผลิตภัณฑ์ ดังนั้นการนำเอาข้อดีของปฏิกิริยาการเปลี่ยนแปลงโครงสร้าง (จากซีโอไลต์ชนิดเคแอล), ปฏิกิริยาการเกิดสารอะโรมาติกส์ (จากแพลตินั่มบนเคแอลซีโอไลต์), และปฏิกิริยาที่เปิดวง (จากแพลตินั่มบนววยซีโอไลต์) มาใช้ให้เป็นประโยชน์สามารถทำได้โดยการนำเอาตัวเร่งปฏิกิริยาเหล่านี้มาใช้ร่วมกันในเตาปฏิกรณ์ไพโรไลซิส งานวิจัยนี้เป็นการศึกษาผลของการผสมกันระหว่างซีโอไลต์ที่มีความเป็นกรด (ววย) และเบส (เคแอล) และลำดับของการวางตัวเร่งปฏิกิริยาในเตาปฏิกรณ์ โดยมีความคาดหวังที่จะผลิตองค์ประกอบที่มีคุณค่าสูงในผลิตภัณฑ์ ในการทดลองมีการทดสอบผลของการเปลี่ยนแปลงอัตราส่วนของ ซีโอไลต์ชนิดเคแอลจาก 0.25 ถึง 1 พร้อมทั้งกำหนดการบรรจุปริมาณของตัวโลหะแพลตินั่มไว้คงที่ที่ร้อยละ 1 โดยน้ำหนัก ด้วยวิธีการทำให้เอิบชุ่ม จากผลการศึกษาแสดงให้เห็นอย่างชัดเจนว่า ปริมาณของโอเลฟินส์ชนิดเบาและปริมาณก๊าซหุงต้มที่ได้จากการผสมระหว่างววยและเคแอลซีโอไลต์มีค่ามากกว่าการใช้ตัวเร่งปฏิกิริยาเพียงชนิดเดียว โดยเฉพาะอย่างยิ่งตัวเร่งที่มีอัตราส่วนของซีโอไลต์เคแอลเท่ากับ 0.25 นั้น สามารถผลิตโอเลฟินส์ชนิดเบาและก๊าซหุงต้มได้มากที่สุด นอกจากนี้ยังพบอีกว่า เมื่อวางตัวเร่งแพลตินั่มบนเคแอลซีโอไลต์บนชั้นแรก และวางตัวเร่งแพลตินั่มบนววยซีโอไลต์ไว้ในชั้นที่สองในอัตราส่วน 0.25 ทำให้สามารถผลิตสารประกอบไฮโดรคาร์บอนอิมได้ตัวสูงที่สุด ดังนั้นการนำตัวเร่งปฏิกิริยามาใช้ร่วมกันในลักษณะนี้ ทำให้ผลิตน้ำมันดีเซลคุณภาพดีได้ นอกจากนี้ตัวเร่งแพลตินั่มบนเคแอลซีโอไลต์ ยังให้สารประกอบอะโรมาติกส์ในมัลทินได้สูงที่สุด ดังนั้นค่าออกเทนของน้ำมันที่ผลิตได้จากตัวเร่งนี้ก็น่าจะมีค่าสูงขึ้นจากเดิมเช่นกัน

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TABLE OF CONTENTS

	PAGE
Title Page	i
Abstract (in English)	iii
Abstract (in Thai)	iv
Acknowledgements	v
Table of Contents	vi
List of Tables	vii
List of Figures	xiii
 CHAPTER	
I INTRODUCTION	1
II LITERATURE REVIEW	4
III EXPERIMENTAL	17
3.1 Materials	17
3.2 Equipment and Chemicals	17
3.3 Experimental Procedures	18
3.3.1 Catalyst Preparation	18
3.3.2 Pyrolysis Process	19
3.3.3 Product Analysis	21
3.3.4 Catalyst Characterization	23
IV RESULTS AND DISCUSSION	25
4.1 Catalyst Characterization	25
4.1.1 Crystal Structure of the Catalysts	25
4.1.2 Physical Properties and Catalytic Activities	26
4.2 Effect of Double Beds on Pyrolysis Products	27

CHAPTER	PAGE
4.2.1 Product Yields	27
4.2.2 Gas Composition	29
4.2.2.1 Light Olefins and Cooking Gas production	30
4.2.3 Oil Products	31
4.2.4 Coke and Sulfur Formation	39
4.3 Effect of Platinum Loading on Double Bed Catalysts	41
4.3.1 Pyrolysis Yields	41
4.3.2 Gas Composition	44
4.2.2.1 Light Olefins and Cooking Gas production	44
4.3.3 Oil Products	46
4.3.4 Coke and Sulfur Formation	51
V CONCLUSIONS AND RECOMMENDATIONS	56
5.1 Conclusions	56
5.1 Recommendations	57
REFERENCES	58
APPENDICES	66
Appendix A Operating Temperature	66
Appendix B Yields of Pyrolysis Products	92
Appendix C Pyrolysis Gas Composition, g/100 g Tires	93
Appendix D True Boiling Point Distillation (°C)	97
Appendix E Chemical Compositions of Maltenes	123
Appendix F Carbon Number Distribution of Maltenes	125
Appendix G Petroleum Fractions of Derived Oils	129
Appendix H Asphaltenes	131
CURRICULUM VITAE	132

LIST OF TABLES

TABLE		PAGE
2.1	The structure of KL and Y zeolites	7
3.1	The optimized composition and volumes of mobile phases for maltenes separation	22
3.2	Hammett indicators used for the measurement of basic and acid strength	24
4.1	Physical properties and acid strength of all physical mixtures	27
4.2	Coke and sulfur formation from the different packing styles without platinum loading	40
4.3	Pyrolysis products obtained from the different packing styles of Y and KL zeolites	42
4.4	Pyrolysis product obtained from different packing styles of Pt/Y and Pt/KL zeolites	43
4.5	Petroleum fractions and chemical compositions in the liquid products obtained from the different packing styles of Y and KL zeolites	46
4.6	Petroleum fractions and chemical compositions in the liquid products obtained from the different packing styles of Y and KL zeolites with platinum loading	47
4.7	Coke and sulfur formation from the different packing styles with platinum loading	52
A1	Pyrolysis conditions: non-catalytic pyrolysis	66
A2	Pyrolysis conditions: non-catalytic pyrolysis	67
A3	Pyrolysis conditions: catalytic pyrolysis using KL	68
A4	Pyrolysis conditions: catalytic pyrolysis using KL	69
A5	Pyrolysis conditions: catalytic pyrolysis using Y	70
A6	Pyrolysis conditions: catalytic pyrolysis using Y	71

TABLE	PAGE
A7 Pyrolysis conditions: catalytic pyrolysis using Y and K (Y + KL at $\emptyset_{KL} = 0.25$)	72
A8 Pyrolysis conditions: catalytic pyrolysis using Y and KL (Y + KL at $\emptyset_{KL} = 0.5$)	73
A9 Pyrolysis conditions: catalytic pyrolysis using Y and KL (Y + KL at $\emptyset_{KL} = 0.75$)	74
A10 Pyrolysis conditions: catalytic pyrolysis using Y and KL (Y \rightarrow KL at $\emptyset_{KL} = 0.25$)	75
A11 Pyrolysis conditions: catalytic pyrolysis using Y and KL (Y \rightarrow KL at $\emptyset_{KL} = 0.5$)	76
A12 Pyrolysis conditions: catalytic pyrolysis using Y and KL (Y \rightarrow KL at $\emptyset_{KL} = 0.75$)	77
A13 Pyrolysis conditions: catalytic pyrolysis using Y and KL (KL \rightarrow Y at $\emptyset_{KL} = 0.25$)	78
A14 Pyrolysis conditions: catalytic pyrolysis using Y and KL (KL \rightarrow Y at $\emptyset_{KL} = 0.5$)	79
A15 Pyrolysis conditions: catalytic pyrolysis using Y and KL (KL \rightarrow Y at $\emptyset_{KL} = 0.75$)	80
A16 Pyrolysis conditions: catalytic pyrolysis using Pt/KL	81
A17 Pyrolysis conditions: catalytic pyrolysis using Pt/Y	82
A18 Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y + Pt/KL at $\emptyset_{Pt/KL} = 0.25$)	83
A19 Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y + Pt/KL at $\emptyset_{Pt/KL} = 0.5$)	84
A20 Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y + Pt/KL at $\emptyset_{Pt/KL} = 0.75$)	85
A21 Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y \rightarrow Pt/KL at $\emptyset_{Pt/KL} = 0.25$)	86

TABLE	PAGE	
A22	Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y ---> Pt/KL at $\emptyset_{Pt/KL} = 0.5$)	87
A23	Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/Y ---> Pt/KL at $\emptyset_{Pt/KL} = 0.75$)	88
A24	Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/KL ---> Pt/Y at $\emptyset_{Pt/KL} = 0.25$)	89
A25	Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/KL ---> Pt/Y at $\emptyset_{Pt/KL} = 0.5$)	90
A26	Pyrolysis conditions: catalytic pyrolysis using Pt/Y and Pt/KL (Pt/KL ---> Pt/Y at $\emptyset_{Pt/KL} = 0.75$)	91
B1	Effects of KL, Y and platinum-supported catalysts	92
B2	Effects of physical mixtures and platinum-supported catalysts	92
B3	Effects of packing sequence (Y ---> KL) and platinum-supported catalysts	92
B4	Effects of packing sequence (KL ---> Y) and platinum-supported catalysts	92
C1	Influences of various zeolites	93
C2	Influences of physical mixtures (Y + KL) and corresponding platinum-supported beds (Pt/Y + Pt/KL)	94
C3	Influences of packing sequence (Y ---> KL) and corresponding platinum-supported beds (Pt/Y ---> Pt/KL)	95
C4	Influences of packing sequence (KL ---> Y) and corresponding platinum-supported beds (Pt/KL ---> Pt/Y)	96
D1	Non-catalytic case	97
D2	Non-catalytic case	98
D3	KL zeolite	99
D4	KL zeolite	100
D5	Y zeolite	101

TABLE	PAGE	
D6	Y zeolite	102
D7	Physical mixture (Y + KL) at $\emptyset_{KL} = 0.25$	103
D8	Physical mixture (Y + KL) at $\emptyset_{KL} = 0.5$	104
D9	Physical mixture (Y + KL) at $\emptyset_{KL} = 0.75$	105
D10	Packing sequence (Y ---> KL) at $\emptyset_{KL} = 0.25$	106
D11	Packing sequence (Y ---> KL) at $\emptyset_{KL} = 0.5$	107
D12	Packing sequence (Y ---> KL) at $\emptyset_{KL} = 0.75$	108
D13	Packing sequence (KL ---> Y) at $\emptyset_{KL} = 0.25$	109
D14	Packing sequence (KL ---> Y) at $\emptyset_{KL} = 0.5$	110
D15	Packing sequence (KL ---> Y) at $\emptyset_{KL} = 0.75$	111
D16	Pt/KL	112
D17	Pt/Y	113
D18	Physical mixture (Pt/Y + Pt/KL) at $\emptyset_{Pt/KL} = 0.25$	114
D19	Physical mixture (Pt/Y + Pt/KL) at $\emptyset_{Pt/KL} = 0.5$	115
D20	Physical mixture (Pt/Y + Pt/KL) at $\emptyset_{Pt/KL} = 0.75$	116
D21	Packing sequence (Pt/Y ---> Pt/KL) at $\emptyset_{Pt/KL} = 0.25$	117
D22	Packing sequence (Pt/Y ---> Pt/KL) at $\emptyset_{Pt/KL} = 0.5$	118
D23	Packing sequence (Pt/Y ---> Pt/KL) at $\emptyset_{Pt/KL} = 0.75$	119
D24	Packing sequence (Pt/KL ---> Pt/Y) at $\emptyset_{Pt/KL} = 0.25$	120
D25	Packing sequence (Pt/KL ---> Pt/Y) at $\emptyset_{Pt/KL} = 0.5$	121
D26	Packing sequence (Pt/KL ---> Pt/Y) at $\emptyset_{Pt/KL} = 0.75$	122
E1	Effects of KL, Y and platinum-supported catalysts	123
E2	Effects of physical mixtures and platinum-supported catalysts	123
E3	Effects of packing sequence (Y ---> KL) and platinum-supported catalysts	123
E4	Effects of packing sequence (KL ---> Y) and platinum-supported catalysts	124
F1	Influences of various zeolites	125

TABLE		PAGE
F2	Influences of physical mixtures (Y + KL) and corresponding platinum-supported beds (Pt/Y + Pt/KL)	126
F3	Influences of packing sequence (Y ---> KL) and corresponding platinum-supported beds (Pt/Y ---> Pt/KL)	127
F4	Influences of packing sequence (KL ---> Y) and corresponding platinum-supported beds (Pt/KL ---> Pt/Y)	128
G1	Effects of KL, Y and platinum-supported catalysts	129
G2	Effects of physical mixtures and platinum-supported catalysts	129
G3	Effects of packing sequence (Y ---> KL) and platinum-supported catalysts	129
G4	Effects of packing sequence (KL ---> Y) and platinum-supported catalysts	130
H1	Effects of non platinum-supported catalysts	131
H2	Effects of platinum-supported catalysts	131

LIST OF FIGURES

FIGURE		PAGE
2.1	Sulfide network formation.	4
2.2	Tire components and main rubber compositions in tire: (a) diagonal tire, and (b) radial tire.	5
2.3	Mixture design for the system of ZSM-5/beta/rhenium.	14
2.4	Direct and two-stage routes for converting pyrolysis gasoline into C ₂ + <i>n</i> -alkanes, a high-quality synthetic feedstock for steamcrackers.	16
3.1	The order of catalyst packing in the reactor.	19
3.2	An autoclave reactor used in the experiment.	20
3.3	Schematic of the pyrolysis process.	20
4.1	XRD patterns of (a) physical mixtures (Y + KL) and (b) physical mixtures with platinum loading (Pt/Y + Pt/KL) at various weight fractions of KL	26
4.2	G/L ratio at different packing sequences and various weight fractions of KL.	28
4.3	Distribution of gas compositions for the case of physical mixtures of Y and KL zeolites.	29
4.4	Effects of double bed packing and the weight fraction of KL on light olefins production.	30
4.5	Effects of double bed packing and the weight fraction of KL on cooking gas production.	31
4.6	Effect of physical mixing (Y + KL) on petroleum fractions in maltenes.	32
4.7	Effect of packing sequence (Y ---> KL) on petroleum fractions in maltenes.	33
4.8	Effect of packing sequence (KL ---> Y) on petroleum fractions in maltenes.	34

FIGURE	PAGE
4.9 Chemical composition in maltene obtained from the physical mixtures of zeolites (Y + KL) with various weight fractions of KL.	36
4.10 Chemical composition in maltene obtained from the packing sequence (Y ---> KL) with various weight fractions of KL.	37
4.11 Chemical composition in maltene obtained from the packing sequence (KL ---> Y) with various weight fractions of KL.	38
4.12 Weight fraction of asphaltene in pyrolytic oils obtained from using the double beds of zeolites.	39
4.13 The $\alpha_{G/L}$ at different styles of double bed packing and various weight fractions of KL.	44
4.14 The $\alpha_{\text{light olefins}}$ at different packing sequences and various weight fractions of KL.	45
4.15 The $\alpha_{\text{cooking gas}}$ at different packing sequences and various weight fractions of KL.	45
4.16 The α_{Naphtha} obtained from different packing styles at various weight fractions of KL.	48
4.17 The α_{Kerosene} obtained from different packing styles at various weight fractions of KL.	48
4.18 The $\alpha_{\text{Gas oil}}$ obtained from different packing styles at various weight fractions of KL.	49
4.19 The $\alpha_{\text{Saturated hydrocarbons}}$ obtained from different packing styles at various weight fractions of KL.	50
4.20 The $\alpha_{\text{Total aromatic hydrocarbons}}$ obtained from different packing styles at various weight fractions of KL.	50
4.21 The $\alpha_{\text{asphaltene}}$ at different packing sequences and various weight fractions of KL.	51