

**DEPARTMENT OF CHEMICAL ENGINEERING
FACULTY OF ENGINEERING
PRINCE OF SONGKLA UNIVERSITY**

Midterm Examination: 2nd Semester

Academic year: 2009

Date: December 19th, 2009

Time: 9:00 – 12:00

Subject : 230-520 Catalyst

Room : A401

ทูลจริตในการสอบ โทษชั้นต่ำปรับตกในรายวิชานั้น หรือ พักการเรียน
1 ภาคการศึกษา และ โทษสูงสุดคือ ให้ออก

คำสั่ง

1. ห้ามนำข้อสอบชุดนี้ออกจากห้องสอบ
2. เป็นการสอบแบบห้ามนำเอกสารเข้าห้องสอบ
ยกเว้น พจนานุกรม หรือ Talking Dictionary
3. อนุญาตให้ใช้เครื่องคำนวณทุกชนิด และใช้ดินสอในการทำข้อสอบ
4. ห้ามพูดคุยหรือหยิบยื่นเอกสาร เครื่องคำนวณ หรือเครื่องเขียน
5. หากท่านทำข้อสอบเสร็จก่อนหมดเวลา ให้นั่งอยู่กับที่แล้วยกมือแจ้งกรรมการคุมสอบ

ข้อสอบมี 7 ข้อ 12 หน้า (รวมปก)

Name.....ID.....

| | | | | | | | | |
|----------------|----------|----------|----------|----------|----------|----------|----------|--------------|
| Problem | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
| Score | 30 | 25 | 20 | 20 | 20 | 25 | 40 | 180 |
| You got | | | | | | | | |

Sukritthira Ratanawilai

December 2009

1. (30 points; 3 points/each subject) Give a brief definition or description and an example (when requested) of the following subjects.

1.1 Catalyst (give example)

1.2 % Dispersion

1.3 Activation energy

1.4 Monolithic catalyst

1.5 Dissociate adsorption (give example)

----- THIS PAGE IS RESERVED FOR PROBLEM 1 -----

1.6 PSSH

1.7 Fischer-Tropsch (give example)

1.8 Catalyst selectivity

1.9 Chemisorption

1.10 LEED

2. (25 points; 5 points/each question) Find the answer of each question
- 2.1 What are cationation and reduction; how different?
- 2.2 What is different between N_2 physisorption and Hg porosimetry?
- 2.3 What is the application of this class to the real world? In other words, what value does this work have to other catalyst researchers or people working in the catalyst industry?
- 2.4 What are co-precipitation and impregnation; how different?
- 2.5 Why is measurement of catalyst surface area important? List at least 2 reasons.

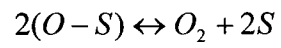
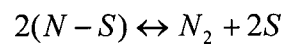
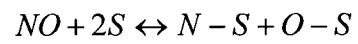
3. (20 points) Describe in as much detail as possible (including calculation), the procedure for preparing "The catalyst" which you prepared in class.

4. (20 points) Derive the Langmuir-Hinshelwood adsorption and concentration of adsorbed and vacant site (θ) for the following cases:

4.1 Molecular adsorption of NO

4.2 Dissociate adsorption of H₂

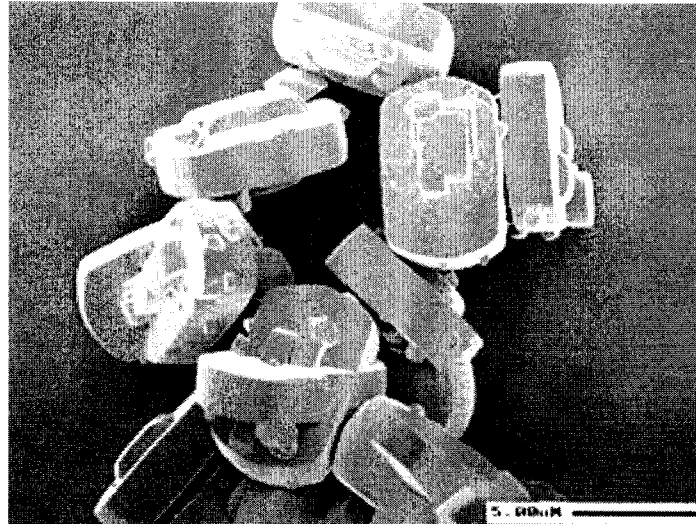
5. (20 points) NO decomposition on Cu-ZSM-5 is occurred by the following mechanism where S is a surface site. Derive a rate expression by using Hougen-Watson model.



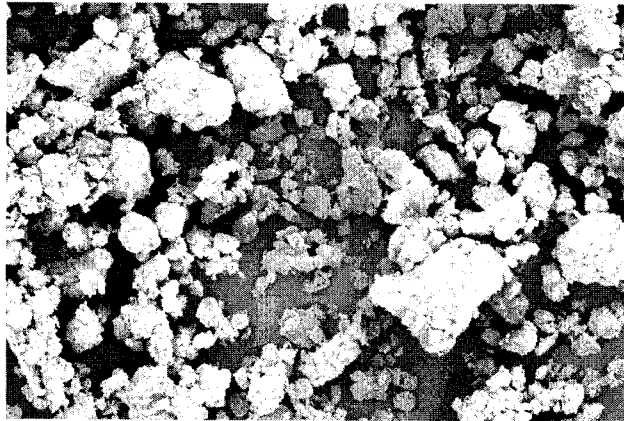
6. (25 points) Imagine yourself the newly appointed manager of catalysis group at a large chemical company. Suppose further that your management has offered to provide 50 million Baht for purchase of new equipments for catalyst characterization, since you presently have none using. Write a short 1 page proposal listing the equipments, approximate costs, and a short justification for purchasing each piece of equipment.

7. (40 points; 10 points/each figure) Explain and analyze the figure in detail and which instruments you would use to obtain a result as in the figure for the following figures?

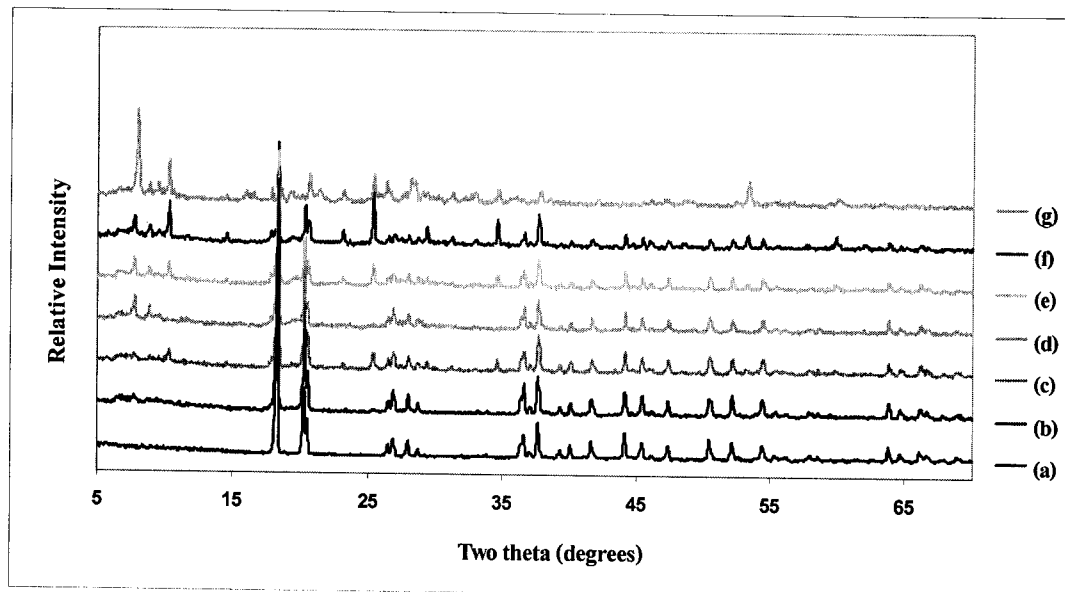
7.1 The ZSM-5 zeolite



7.2 15% HPW/ Al_2O_3



7.3 (a) Pure Al_2O_3 , (b) 5% HPW/ Al_2O_3 , (c) 10% HPW/ Al_2O_3 , (d) 15% HPW/ Al_2O_3 , (e) 20% HPW/ Al_2O_3 , (f) 30% HPW/ Al_2O_3 and (g) Pure HPW



7.4 (a) Pure Al_2O_3 , (b) 5% HPW/ Al_2O_3 , (c) 10% HPW/ Al_2O_3 , (d) 15% HPW/ Al_2O_3 ,
(e) 20% HPW/ Al_2O_3 , (f) 30% HPW/ Al_2O_3 and (g) Pure HPW

