

Adsorption (ChE568)

(3 Credits, Time: MW 8:55 am - 10:10 am, JH-109, Spring, 2009)

Instructor

Dr. Shuguang Deng; Tel: 505-646-4346, e-mail: sdeng@nmsu.edu

Course Description

This course presents an introduction to adsorption science and technology. It includes adsorption equilibrium and kinetic theories, adsorbent materials and characterization, adsorption processes and design. Selected applications of adsorption processes in chemical and pharmaceutical industries and environmental protections will also be discussed.

Textbook: Douglas M. Ruthven "Principles of Adsorption and Adsorption Processes" Wiley-Interscience (May 1984) ISBN: 0471866067 List Price: \$260.00 (NMSU Bookstore)
Handouts and selected readings will also be distributed by instructor.

Recommended References:

1. Duong D. Do "Adsorption Analysis: Equilibria and Kinetics" Imperial College Press; Book and CD-ROM edition (December 1998) ISBN: 1860941303 \$93.00
2. Gregg, S.J. and K.S.W. Sing, "Adsorption, Surface Area and Porosity" 2nd Edition, Academic Press, London (1982).
3. Yang, R.T. "Gas Separation by Adsorption", Butterworths, Stoneham, MA (1987).
4. Yang, R.T. "Adsorbents: Fundamentals and Applications", John Wiley & Sons, Hoboken, New Jersey (2003).

Attendance:

It is the policy of NMSU that students should attend every class meeting unless valid reasons prevent doing so. Be respectful to your classmates and show up on time. Please notify Course Instructors as early as possible if you can't attend the class due to other commitments or medical excuse.

Grading:

There will be 5 quizzes, one term paper and a presentation. The guidelines for term paper and presentation will be provided.

Homework	25%
Quizzes	40%
Term Paper	25%
Presentation	10%
A: 85-100; B: 75-84; C: 65-74; D: 60-64; F: <60	

Re-grades:

Re-grades can be done at the request of student within one week of the return date of the graded assignments. A memo explaining why a re-grade is necessary must be attached to the front page of the assignment. The score on the assignment may increase or decrease after re-grade.

Course Webpage: <http://cheme.nmsu.edu/~sdeng/ChE468>

Topics

Development of Adsorption Science and Technology

Adsorption Equilibrium

Forces and energies of adsorption

Experimental adsorption isotherms

Theories of adsorption equilibrium

Adsorption of gases mixtures

Adsorption Kinetics

Diffusion in porous media

Kinetics of adsorption in batch systems

Flow through packed beds

Dynamics of Adsorption Columns

Adsorbents and Characterization

Commercial adsorbents

Novel adsorbents

Adsorbent characterization

Adsorption Separation Processes

Methods of regeneration

Thermal swing processes

Pressure swing processes

Displacement desorption

Adsorption Process Design

Data requirements

Rigorous methods

Scale-up and pilot-plant studies

Adsorption process simulation

Applications of Adsorption Processes

Gas separation and purification

Water treatment and air pollution control

Chromatographic separation of pharmaceutical ingredients

ChE 568 Spring 2009 Course Outline and Tentative Schedule

Lecture	Date	Topic	Dues
1	1/15	Introduction (I)	
2	1/20	Introduction (II)	
3	1/22	Adsorption Equilibrium (I)	
4	1/27	Adsorption Equilibrium (II)	
5	1/29	Adsorption Equilibrium (III)	
6	2/3	Adsorption Equilibrium (IV)	
7	2/5	Adsorption Equilibrium (V)	
8	2/10	Adsorption Equilibrium (VI)	
9	2/12	Adsorption Kinetics (I)	
10	2/17	Adsorption Kinetics (II)	
11	2/19	Adsorption Kinetics (III)	
12	2/24	Adsorption Kinetics (IV)	
13	2/26	Adsorption Kinetics (V)	
14	3/3	Adsorbents and Characterization (I)	
15	3/5	Adsorbents and Characterization (II)	
16	3/10	Adsorbents and Characterization (III)	
17	3/12	Adsorbents and Characterization (IV)	
18	3/17	Adsorbents and Characterization (V)	
19	3/19	Adsorption Separation Processes (I)	
20	3/31	Adsorption Separation Processes (II)	
21	4/2	Adsorption Separation Processes (III)	
22	4/7	Adsorption Process Design (I)	
23	4/9	Adsorption Process Design (II)	
24	4/14	Adsorption Process Design (III)	
25	4/16	Applications (I)	
26	4/21	Applications (II)	
27	4/23	Applications (II)	
28	4/28	Student Presentations	
29	4/30	Student Presentations	