

10.420/10.520 Molecular Aspects of Chemical Engineering

Instructor: Prof. Paula T. Hammond
66-550/8-7577
hammond@mit.edu

Office Hours: Immediately after class. Appointments made via email.

Text: None, but numerous topical handouts from the recent literature and other materials including:

"Environmental Organic Chemistry", René Schwarzenbach, Philip Gschwend, and Dieter Imboden, Wiley, 1993.

"Intermolecular & Surface Forces", second edition, Jacob Israelachvili, Academic Press, 1992.

"Physical Chemistry of Surfaces", 6th Ed., A.W. Adamson and A.P. Gast, Wiley, 1997.

"Molecular Aspects of Cell Biology", R.H. Garrett and C. M. Grisham, Saunders College Publishing, 1995.

Grading: 5% Problem Sets
30% Quiz 1 (October 25)
30% Quiz 2 (November 24)
35% Course Paper (Assignment made mid-term; paper is due on December 8)

Course Calendar for 10.420/10.520

SEPTEMBER	
8	Course Introduction, Perspective on Intermolecular Interactions and Relevance to Application
10	Molecular Interactions: Influence on Macroscopic Properties
13	Review of Chemical Structures and Trends
15	Polar and VanderWaal Interactions
17	Dielectric Constants – Origin and Importance
20	Solvation, Solvent Design, Solute Partitioning
22	
24	Chelation and Co-solvents
27	Solvation of Large Molecules - Polymer Solubility
29	Block Copolymers- Ordered Nanophases
OCTOBER	
1	Introduction to Solid State and Intermolecular Interactions
4	Molecular Crystals
6	Hydrogen Bonding in the Solid State
8	Molecular Recognition and Self Assembly
11	*** STUDENT HOLIDAY –COLUMBUS DAY ***
13	Liquid Crystalline Systems - Thermotropic
15	Liquid Crystalline Systems – Lyotropic and Bio Examples
18	Micellar Systems
20	Micellar Systems
22	Micellar Systems/ Applications
25	QUIZ 1
27	Introduction to Liquid/Solid Interactions
29	Wetting
NOVEMBER	
1	Wetting
3	Fundamentals of Adhesion
5	Adhesion (special guest – Christine Ortiz)
8	
10	Molecular Adsorption
12	Friction
15	Polymer Adsorption/ Adhesion to Surfaces
17	Polymer Surface Modification/ Surface Engineering
19	Organic Monolayers (SAMs)
22	Organic Monolayers
24	Quiz 2
26	*** THANKSGIVING HOLIDAY ***
29	Bio applications of organic monolayers/ bioadhesion
DECEMBER	
1	Other applications of surface modification
3	Project Presentations
6	Project Presentations
8	Project Presentations