

## Environmental Geochemistry, Spring 2007

**Course Id:** CHEM 609/GEOS 633 (3 cr.)

**Lecture:** TTH 2:00-3:30 (NSCI 165)

**Instructor:** Tom Trainor  
Rm 176 NSCI  
474-5628  
[fftpt@uaf.edu](mailto:fftpt@uaf.edu)

**Office Hours:** MW 1:00-3:00

**Grading:**

Problem Sets	40%
Project	50%
Presentation	10%
	100%

### **Course description and goals:**

This course is focused on advanced topics related to the chemistry of aquatic and soil/sediment environments and the interactions between aqueous solutions and geomedia. Particular emphasis is placed on heterogeneous interactions, including dissolution/precipitation and sorption processes involved in the partitioning, transformation and transport of metal(loid) species in the environment. The goal is to provide students with the conceptual background required for critical review and interpretation of the current environmental geochemistry literature.

### **Topics:**

- Environmental solids: structure, composition and crystal chemistry
- Mineral surfaces: surface chemistry and heterogeneous reactions
- Weathering reactions: sequences, rates and mechanisms
- Metal(loid) speciation and cycling pathways
  - Fe, Mn
  - Trace metals: As, Se, Sb, Cd, Pb, Zn, U,  
(Choice and depth of discussion depending on student interest)
- Possible special topics (chosen depending on time and interest):
  - Acid mine drainage
  - Biomineralization and biosorption
  - Basalt-seawater interactions (biotic and abiotic)
  - Geochemical modeling applications
  - Techniques for trace metal(loid) speciation analysis
  - Techniques in experimental mineral surface chemistry

### **Text**

D. Langmuir, Aqueous Environmental Geochemistry, Prentice Hall

### **Additional Sources:**

D.C. Adriano, Trace Elements in Terrestrial Environments, Springer

G. Sposito, The Chemistry of Soils, Oxford University Press

M McBride, Environmental Chemistry of Soils, Oxford University Press

W. Stumm and J. Morgan, Aquatic Chemistry 3<sup>rd</sup> ed., Wiley-Interscience

C. Bethke, Geochemical Reaction Modeling, Oxford University Press

R. Hunter, Foundations of Colloid Science, Oxford Science Publishers

H.L. Ehrlich, Geomicrobiology, Marcel Dekker

### **Computer Lab:**

Your enrollment in this course gives you user privileges in the Department's computer lab. Information and policies are available at URL:

[www.uaf.edu/chem/NewNetwork.html](http://www.uaf.edu/chem/NewNetwork.html).

Animated viewlets for common operations are at URL:

<http://www.uaf.edu/chem/Viewlets/ChemLabHowTo.html>.

### **Student with Documented Disabilities:**

Student with a physical or learning disability, who may need academic accommodations, should contact the Disability Services office (203 WHIT, 474-7043). Disability Services will then notify the instructor of special arrangements for course work.

### **Ethical Considerations:**

The Chemistry Department Policy on Cheating is: *“Any student caught cheating will be assigned a course grade of F. The student will not be allowed to drop the course.”*

The UAF Honor Code states: *“Student will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations. Student will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrase) in compositions, these and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion”*

Students may collaborate on homework assignments, however, each individual should submit their own copy showing all their work. Exams and projects are to be completed independently.

### Class Projects

Independent research projects should be developed around a topic of your interest that fits within the scope of environmental geochemistry. You should consult with me early in the semester about project ideas and the scope of your work. The project could involve an experiment, characterization of environmental samples or development of a geochemical model. The final product will be a written report and an in class lecture covering the general topic you have chosen to investigate.