Environmental Chemistry II: Organic Geochemistry of Natural Waters and Sediments

CHM 4081 / CHM 5087

FALL, 2009 - COURSE SYLLABUS

Instructor: Dr. Bill Cooper, 415 DLC, 644-6875, cooper@chem.fsu.edu
Office Hours: 11:30 - 12:30, Monday; 2:30 – 3:30 Wednesday

Meetings: 10:10 – 11:00 MWF, 218 HTL

Primary Texts:
Petroleum Formation and Occurrence, Tissot & Welte
Environmental Organic Chemistry, Schwarzenbach, Gschwend & Imboden
Organic Geochemistry of Natural Waters, Thurman
Humus Chemistry, Stevenson

NOTE: None of these books are currently in print. Photocopied sections of the appropriate chapters from each book will be compiled in a **Course Notebook** that will be available in 411 DLC throughout the semester. Additional required readings from the scientific literature will also be made available in the **Notebook**.

Course Web Page: Most of the important information for this course will be posted on the course web site. The site is located on FSU's Blackboard system (***www.campus.fsu.edu***). You should check the web site frequently, since announcements and other important information will be posted there. NOTE also that Discussion Forums covering various aspects of the course will be set up on the Blackboard system.

Grading:

CHM 4080
2 major exams (80%)
1 class presentation (20%)

CHM 5081
2 major exams (50%)
1 class presentation (20%)
research proposal (30%)

Content: ***Organic Geochemistry of Natural Waters and Sediments*** is an overview of the sources of organic matter in aquatic systems, the important reactions and transport mechanisms which control the biogeochemical cycling of this material and its impact on environmental and ecological processes. We will also discuss the primary subject of classical organic geochemistry; the formation of oil, gas and coal. While we will focus on naturally occurring organic materials, some attention will be devoted to anthropogenic and xenobiotic organic molecules, since the behavior of these two groups is normally quite similar.

CHM 4081/5087 is first and foremost a chemistry class, but we also discuss a significant amount of geology, biology and oceanography. Special attention will also be focused on the rather specialized area of analytical geochemistry, since much of the research being done in this area today relies on sophisticated analytical techniques such as mass spectrometry, nuclear magnetic resonance spectroscopy, chromatographic and electrophoretic separation techniques, and both stable and radioactive isotope measurements. Indeed, a significant fraction of the course will be devoted to discussions of how these techniques provide useful organic biogeochemical information.

This will not be a traditional lecture course, but more of a tutorial. That is, reading assignments (of substantial volume!) will be discussed by the whole class during our meetings, and I will try to provide some direction and guidance to these discussions.

TOPIC OUTLINE

Week of	Topic	Reading Assignment*
8/24	Introduction; The Organic Carbon Cycle. Origin of Organic Matter in Natural Waters.	T&W;I.1, I.2 T&W;I.1, Th; 2
8/31	Quantitative and Qualitative Characteristics of Organic Matter.	T&W;I.4 Th;1,4
9/7	Accumulation and Early Diagenesis of Organic Matter in Sediments. (No class on Monday)	T&W;I.5 T&W;II.1,2

9/14	Formation of Oil, Gas and Coal.	T&W;II.4-8
9/21	Geochemical Fossils (Biomarkers) and Molecular Paleoecology.	T&W;II.3
9/28	Humic Substances I. Soil Organic Matter.	Th;10 St; 1,2
10/5	Humic Substances II.	St; 8, 9, 11, 12
10/12	Dissolved Organic Matter.	
10/19	Fall Break, No classes	
10/26	Biochemical Processes; Microbial Transformations of Naturally Occurring Organic Matter.	Th;12
11/2	Sorption and Ion-Exchange. Metal-Humate Interactions.	Th;11 S,G&I; 7,11
11/9	Isotopic Fractionation during Biogeochemical Cycling. (No class on Wednesday)	
11/16	Isotopic Signals in Dissolved and Sedimentary Organic Matter.	
11/23	Global Warming.	
11/30	Global Warming (cont). ***Exam 2***	

*T&W: Tissot & Welte
Th: Thurman
S,G&I; Schwarzenbach, Gschwend & Imboden
St: Stevenson