AT 715 (2 Credits)
Atmospheric Oxidation Processes
Fall 2007
Instructor: Jeff Collett
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Office Hours: By Arrangement

Objectives:

1. Develop an understanding of kinetic and equilibrium aspects of important chemical pathways in the atmosphere.

2. Examine the detailed mechanisms that account for the reactions of hydrocarbons and nitrogen oxides in the atmosphere and resultant oxidant formation.

3. Consider the molecular composition and formation of organic aerosol particles.

4. Examine the role of heterogeneous processes, especially aqueous phase scavenging and reactions, in tropospheric chemistry.

Text:

Chemistry of the Upper and Lower Atmosphere: Theory, Experiments and Applications, by Finlayson-Pitts and Pitts, Academic Press, 2000. Supplemental readings will be assigned from relevant journals and other texts.

Some relevant journals: *Environmental Science and Technology, Journal of Atmospheric Chemistry, Atmospheric Environment, Tellus B, Journal of Geophysical Research, Atmospheric Chemistry and Physics* (on-line), *Journal of the Air and Waste Management Association*

Course Structure and Grading Criteria:

The course is offered for two credits. The class is conducted in a lecture/discussion format and is scheduled to meet at 2:00 Mondays and Wednesdays.

One oral exam will be offered. This exam will cover material from lectures.

Each student will be expected to lead or co-lead a one-hour discussion of a research article. Active participation in discussions of other articles is also expected.

Preparation for class (especially reading) and participation in class discussions are important components of the course.

Grades will be weighted as follows:	Class Participation:	20%
	Oral Exam:	40%
	Article Discussion:	40%

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Fall 2007 Schedule

Date	Lecture Topic	Reading (in text unless otherwise noted)
August 20	No class (ACS Meeting)	
August 22, 27	Thermodynamics and reaction kinetics	pp. 130-150
August 29, 31 (Fri, 2:30-3:20)	Photochemistry (Light absorption and fates of excited molecules)	pp. 43-83
Sept. 3	Labor Day holiday; no class	
Sept. 5, 10	Photochemistry cont'd. (Photolyzing tropospheric species)	pp. 86-111
Sept. 12	Photochemistry (Radical generation)	pp. 179-181
Sept. 17, 19	Hydrocarbon oxidation mechanisms	pp. 181-225
Sept. 24, 26	No class (AAAR Meeting)	
Oct. 1	Hydrocarbon oxidation mechanisms (cont'd).	
October 3	Inorganic nitrogen chemistry	pp. 265-286
October 5 (Fri), 8	Ozone formation and control	pp. 882-918
October 10	Article Discussion #1	Sillman et al. (1997) The use of photochemical indicators to evaluate ozone-NO_x-hydrocarbon sensitivity: case studies from Atlanta, New York and Los Angeles. *JAWMA* **47**, 1030-1040
October 15	Biogenic hydrocarbons	pp. 225-234
October 17	Article discussion #2	Han et al. (2005) Model study of the impact of biogenic emission on regional ozone and the effectiveness of emission reduction scenarios over eastern China. Tellus B **57**, 12–27.
Oct. 19 (Fri), 22, 24, 29	Organic aerosols	pp. 393-423, 436-439, (optional 451-461, 504-527) + TBD
Oct. 31	Article discussion #3	Rogge et al. (1996) Mathematical modeling of atmospheric fine particle-associated primary organic compound concentrations. JGR **101**, 19379-19394.
November 5	Article discussion #4	Tolocka et al. (2004) Formation of oligomers in secondary organic aerosol. *Environ. Sci. Technol.* **38,** 1428 – 1434.
November 7	Article Discussion #5	Donahue et al (2006) *ES&T* Robinson et al (2007) *Science*
November 12 ,14	Aqueous phase chemistry	pp. 294-315, 322-325
Nov 19, 21	No Class; Thanksgiving Holiday	
Nov. 26, 28	Aqueous phase photochemistry	pp. 315-322, handout
Dec. 3	Oral exams (schedule individually)	
Dec. 5	Article discussion #6	Altieri et al. (2006) Evidence for oligomer formation in clouds: reactions of isoprene oxidation products. *Environ. Sci. Tech.* **40**, 4956-4960.