

CHEM6080. Selected Topics in Inorganic Chemistry: Organotransition Metal Chemistry and Catalysis

SPRING 2011

Time and Place: Tuesday, Thursday: 8:00-9:15 am, Room 1228
Instructor: Andrei N. Vedernikov e-mail: avederni@umd.edu
Office: Chemistry 2353 (wing #3) phone: 5-2784
Office hours: Monday, Thursday 2:00-3:00 pm or by appointment: call, e-mail or stop by

Main text: "The Organotransition Metal Chemistry: From Bonding to Catalysis", 1st Edition (hardcover), by John Hartwig. University Science Books, 2010. ISBN-13: 978-1891389535.

Recommended text: The Organometallic Chemistry of the Transition Metals, 5th Edition (Hardcover), by Robert H. Crabtree. Wiley, 2009. ISBN: 978-0-470-25762-3.

Lecture notes, problem sets, this syllabus and other course-related documents can be found at

http://www.chem.umd.edu/groups/vedernikov/VGroup_Teaching-11-608.htm

Problem sets: Will be distributed in class every second Thursday. Solutions are due by next Thursday lecture. All pdf files with current problem sets can be found at the course web-site listed above.

Grading scheme:

Two Midterm Exams	100 points each	200
Final Exam	200 points	200
Seven Problem Sets	20 points each, five best scores counted	100
TOTAL		500

Grades: **A**, $\geq 85\%$; **B**, $\geq 75\%$; **C**, $\geq 65\%$; **D**, $\geq 55\%$.

Tentative lecture and midterm exam schedule:

Note: Numbers in parentheses below correspond to the Chapters in the text by John Hartwig.

Week	Date/Lecture	Topics
1		
Tu	Jan 25 /1	Introduction. Course description. An overview of basic terms of coordination chemistry.
Th	Jan 27 /2	Classification of ligands. 18-electron rule. Isolobal analogy. Trends in bond strength (1).
2		
Tu	Feb 1 /3	Dative (L-type) ligands. Complexes of carbon monoxide and related ligands (2.2, 2.7).
Th	Feb 3 /4	Phosphines. Tolman electronic parameter and cone angle. (2.3) <i>Home work 1</i>
3		
Tu	Feb 8 /5	Metal carbenes and carbynes. (2.4-2.5, 13.2).
Th	Feb 10 /6	Complexes of alkenes, alkynes and arenes (2.6). <i>Home work 1 due</i>
4		
Tu	Feb 15 /7	σ -Complexes (2.8).
Th	Feb 17 /8	X-type ligands. Metal hydrocarbyl complexes (3.2) <i>Home work 2</i>
5		
Tu	Feb 22 /9	Allyl, benzyl and cyclopentadienyl complexes (3.5-3.7).
Th	Feb 24 /10	Metal hydrides (3.8) and halides (4.8). <i>Home work 2 due</i>
6		
Tu	Mar 1 / 11	Metal-ligand multiple bonds (13).
Th	Mar 3 / 12	Fundamental organometallic reactions. Ligand substitution (5). <i>Home work 3</i>
7		
Tu	Mar 8 /	<i>Problem solving (midterm 1 – related)</i>
Th	Mar 10 /	Midterm exam 1 (Lectures 1-12; Chapters 1-3, 5, 13) <i>Home work 3 due</i>
8		
Tu	Mar 15 / 13	Oxidative addition (6, 7).
Th	Mar 17 / 14	Reductive elimination (8). <i>Home work 4</i>
9		
Tu	Mar 22 /	Spring Break
Th	Mar 24 /	
10		
Tu	Mar 29 /15	Insertion reactions (9).
Th	Mar 31 /16	Elimination reactions (10). <i>Home work 4 due</i>
11		
Tu	Apr 5 /17	Nucleophilic attack on coordinated ligands (11).
Th	Apr 7 /18	Electrophilic attack on coordinated ligands (12). <i>Home work 5</i>
12		
Tu	Apr 12 /19	Homogeneous catalysis with TMC. Principles of catalysis. Asymmetric catalysis (14).
Th	Apr 14 /20	Catalytic hydrogenation: alkenes, ketones, imines (15). <i>Home work 5 due</i>
13		
Tu	Apr 19 /	<i>Problem solving (midterm 2 – related)</i>
Th	Apr 21 /	Midterm exam 2 (Lectures 13-22; Chapters 6-12) <i>Home work 6</i>
14		
Tu	Apr 26 / 21	Catalytic hydrofunctionalization and oxidative functionalization of olefins (16).
Th	Apr 28 / 22	Catalytic carbonylation of olefins and related reactions (17). <i>HW 6 due</i>

15		
Tu	May 3 /23	Catalytic CH functionalization reactions (18).
Th	May 5 /24	Catalytic C-C and C-X coupling reactions (19). <i>Home work 7</i>
16		
Tu	May 10 /25	Catalytic alkene metathesis and polymerization (21-22) <i>Home work 7 due</i>
Tu	May. 17	<u>Final exam, 10:30 am -12:30 pm / all covered</u>

Expectations: The students are expected: 1) to attend *all* lectures and read text(s) well in advance before a topic is covered in the class so that the level of discussion and understanding of the course material during lectures will be enhanced; 2) to understand the background theory presented in lectures and in class reading; 3) to work independently and responsibly on problems distributed.

Academic Integrity and Policies:

- The students are expected to follow Honor Code and an Honor Pledge (<http://www.jpo.umd.edu/aca/honorpledge.htm>). The Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents, and forging signatures etc.
- *The students are responsible to inform the instructor of any intended absences in advance. Notice should be provided as soon as possible but no later than the end of the schedule adjustment period.* It is especially important in connection with final examinations, since failure to reschedule a final examination before the conclusion of the final examination period may result in loss of credits during the semester.