

CHM 6251
ORGANOMETALLIC COMPOUNDS
SPRING 2012

Instructor: Lisa McElwee-White, Sisler 429, 392-8768, lmwhite@chem.ufl.edu

Text: "Organotransition Metal Chemistry From Bonding to Catalysis," John Hartwig.

There are also several other books on reserve in the Marston Science Library. See <https://ares.uflib.ufl.edu/> for a list of these.

Lecture: MWF 10:40– 11:30 in Leigh 242

Due to my travel there will be two Saturday mornings where we have makeup lecture 9-11 am. I provide coffee and donuts. These lectures are tentatively scheduled for February 25 and March 31.

Office Hr: MWF 3:00 - 4:00 p.m.

Web Page: Course materials are on e-Learning at <https://lss.at.ufl.edu/>.

Problems: Problem sets will be assigned but will not be collected for grading. Answer keys will be made available on e-Learning.

Exams: February 17, March 23, May 2 (final)
In addition, there will be a short (3-5 page) proposal due April 18.

Grading:

Exam 1	125 points
Exam 2	125 points
Final	200 points
<u>Proposal</u>	<u>50 points</u>
Total	500 points

Prerequisites:

Acquaintance with the mechanistic tools taught in CHM 6225 (kinetics, isotope effects, Arrhenius parameters, etc.) is assumed. Also assumed is a minimal knowledge of symmetry and group theory. That is, you should be able to determine the symmetry elements and point group of a molecule. You should also be able to read a character table. If you need help in this regard, the workbook "Molecular Symmetry and Group Theory" by Alan Vincent is on reserve in Marston Science Library. Working programs 1-3 will provide you with more than enough background.

Course Topics (Note: Topics may be altered as we go)

- I. Chemistry of Organotransition Metal Compounds
 - A. Structure and Bonding
 - B. Ligand Substitution Reactions
 - C. Oxidative Addition and Reductive Elimination
 - i. H₂
 - ii. C-H Activation
 - iii. Alkyl Halides
 - D. Insertion and Elimination Reactions
 - i. CO and Other η^1 -Ligands
 - ii. Olefins
 - iii. β -Hydride Elimination
 - E. Nucleophilic Attack on Ligands
 - i. CO Complexes
 - ii. Carbene and Carbyne Complexes
 - iii. π -complexes
 - F. Electrophilic Attack on Ligands
 - i. σ -bonds
 - ii. Unsaturated Ligands
 - G. Metallacycles
 - i. Metallacyclobutanes and Olefin Metathesis
- II. Catalytic Reactions Involving Organometallic Compounds
 - A. Hydrogenation
 - B. Polymerization of Alkenes and Alkynes
 - C. Water-Gas Shift
 - D. Carbonylation and Hydroformylation
 - E. Fischer-Tropsch Chemistry
- III. Applications of Organometallic Chemistry to Organic Synthesis
 - A. Pd-Catalyzed C-C Coupling (Heck, Stille, Suzuki, Sonogashira)
 - B. Hydroamination and Aryl Amination
 - C. Olefin Metathesis
 - D. π -Allyl Complexes
 - E. Asymmetric Epoxidation and Dihydroxylation
 - F. C-H Activation and Direct Functionalization