

Course title: Principles of Organometallic Chemistry **CHE 4953.001/6973.001**

Lecture: MWF 10:00 – 10:50 AM in BSE 2.212

Instructor: Dr. Zachary Tonzetich, zachary.tonzetich@utsa.edu

Office hours: F 1:30 – 3:00 PM, BSE 1.104B

Course website: Blackboard, <https://bb.utsa.edu>

Course materials:

Organotransition Metal Chemistry: From Bonding to Catalysis, 1st Ed. by John Hartwig, University Science Books 2009 (**required text**)

The Organometallic Chemistry of the Transition Metals, 5th Ed. by Robert H. Crabtree, WILEY 2009

Organometallics, 3rd Ed. by Christoph Elschenbroich, WILEY-VCH 2006

Selected literature and handouts to be distributed in class/online

Course Objectives:

This course is intended to provide students with an introduction to the field of organometallic chemistry covering concepts in bonding, synthesis, and catalysis. Students will become familiar with common ligands and preparative methods in organometallic chemistry, theories of bonding and electronic structure, basic reaction mechanisms, and applications to catalysis in organic chemistry.

Prerequisites: CHE 3464 and CHE 4463 recommended

Evaluation: Undergraduates - Course grade will be based on biweekly problem sets (20%), a midterm (30%), and final exam (50%).

Graduates – Course grades will be based on biweekly problem sets (10%), a midterm (20%), an oral presentation (30%), and a final exam (40%).

Course policies: Attendance at lectures is mandatory and students will be expected to have read the assigned materials prior to each class period. An emphasis will be placed on lecture content and assigned readings from the chemical lecture, although examinations may cover aspects discussed in the textbook and not explicitly mentioned in class. Problem sets are to be completed *individually* by each student and returned by the date set forth by the instructor. Work turned in late may result in a lower grade.

Topics to be covered

Readings from Hartwig

Class organizational details and course introduction	
Fundamental aspects of organometallic chemistry	
Ligand classes	1.1-1.2
Electron counting and the 18-electron rule	1.3
σ -Bonding ligands	2.1-2.5, 2.7-2.8, 3.1-3.2, 3.8 and Ch. 4
π -Bonding ligands	2.6, 3.5-3.7
Metal-ligand multiple bonding I: carbenes	13.1-13.2
Metal-ligand multiple bonding II: carbynes	
Metal-ligand multiple bonding III: imidos, oxos, and nitrides	13.4
Reactions of coordinated ligands	Ch. 5, Ch. 11, Ch. 12
Migratory insertion	Ch. 9
β -H elimination	Ch. 10
Oxidative addition	Ch. 7
Reductive elimination	Ch. 8
C-H activation and agostic interactions	Ch. 6
Midterm examination – 10/6/10	10:00-10:50 AM
General principles of catalysis	Ch. 14
Alkene isomerization	
Alkene hydrogenation	Ch. 15
Hydroformylation	17.3
Hydroamination	16.5
C-C cross coupling	19.1-19.5
C-N and C-X cross coupling	19.6-19.8
Alkene polymerization and oligomerization	Ch. 22
Alkene metathesis	21.1-21.2
Alkyne metathesis	21.3
Bioorganometallic chemistry	
Current topics	
Final examination – 12/8/10	7:30-10:00 AM

Students with disabilities: If you need accommodation related to a disability, please make an appointment during my office hours to discuss your needs. More information about university services provided to students with disabilities can be found online at: <http://www.utsa.edu/disability/students.htm>

Academic dishonesty: Students are expected to conduct themselves with the utmost integrity as laid out in Student Code of Conduct. More information can be found at: <http://www.utsa.edu/infoguide/appendices/b.html> under the section 203.

The "topics to be covered" reflect the anticipated course content and schedule to the best of my knowledge. I reserve the right to modify both the content and its schedule of issuance at any time, but will do my best to communicate any such changes to students as soon as possible either in class or via the course website.