SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Chemistry

Organotransition Metal Chemistry Section 01

CHEM 218

Fall 2023 3 Unit(s) 08/21/2023 to 12/06/2023 Modified 08/20/2023

Contact Information

Madalyn R Radlauer

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Office: ISB 254
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Office Hours

Scheduled: Mondays 2:00 to 3:00 pm, Fridays 10:00 to 11:00 am
ISB 254

You can also request additional office hours at any point, just connect with me to schedule them

Course Description and Requisites

Structure and reaction chemistry of compounds which contain transition metal-carbon bonds. Applications to catalytic processes and to organic synthesis.

Prerequisite: CHEM 112B and CHEM 145 (or equivalents with grades of "C" or better; "C-" not accepted) or instructor consent.

Notes: Alternate years.

Letter Graded

Classroom Protocols

Safe and Respectful Community

I want our classroom to serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. If anything in the classroom makes you feel uncomfortable or disrespected, especially if it is something that I say or do, please bring it to my attention. You all are students, but you are people first and foremost, and the classroom should be a place you feel welcomed and respected.

Email and Canvas Messages

I will do my best to respond to class-related emails or Canvas messages within 1 business day of receiving them.

Attendance and Illness

As a show of respect to your fellow classmates and me, please be on time to class; we will start at 3:30 pm.

Please do not come to class if you do not feel well. Email me and I can set up one of two options for you.

1. If you would like to attend class virtually, we can set up a Zoom meeting as long as you email me at least 10 minutes before class starts.
2. I can get notes sent to you and arrange for you to make up any group work.

If you have COVID symptoms, a positive COVID test, or are exposed to someone who tests positive for COVID, do not come to campus. Email me and I will send you a follow up email with the appropriate protocols to follow. I will do my best to make accommodations so that your progress and grade are not negatively affected should this occur.

There may be other reasons why you may need to miss class or an assignment at some point in the semester. If this is the case, please contact me ahead of class time and with as much of a heads up as possible and we can discuss the situation. The more heads up you can give me, especially with regards to missing exams or assignment deadlines, the better. Even if you cannot give me a heads up, reach out. I will do my best to be accommodating.

Course Goals

The goal of this course is to introduce students to organometallic chemistry focusing on the reactivity of organotransition metal complexes.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be able to:

CLO 1: Classify organometallic complexes based on ligand types and electron count and relate those to predicted reactivity, spectroscopic analysis, and structural characterization.

CLO 2: Appraise proposed mechanisms for reactions involving organometallic complexes by recognizing fundamental reaction types/steps and analyzing kinetic data.

CLO 3: Evaluate experiments and results presented in the literature to interrogate the structure, bonding, and reactivity of organometallic complexes.

CLO 4: Collect (peer-reviewed) papers on an organometallic chemistry topic, critically evaluate that literature, discuss those papers with their scientific colleagues, and develop a perspective on that area of research.

Graduate Program Learning Objectives (PLO)

Upon successful completion of this program, students will be able to:

PLO 1: Demonstrate an advanced understanding of selected topics in chemistry.

PLO 2: Demonstrate information literacy skills for acquiring knowledge of chemistry, both as a student and as a life-long learner.

PLO 3: Communicate effectively, verbally and written, for the purposes of conveying chemical information to both professional scientists and to the public.

Course Materials

Textbook

There is no required textbook for this course.

Other Textbooks (not required, these may provide further clarification of various topics)

Organotransition Metal Chemistry: From Bonding to Catalysis (https://www.amazon.com/Organotransition-Metal-Chemistry-Bonding-Catalysis/dp/189138953X) by John Hartwig

The Organometallic Chemistry of the Transition Metals (https://onlinelibrary.wiley.com/doi/book/10.1002/9781118788301) by Robert H. Crabtree

Inorganic Chemistry (https://www.pearsonhighered.com/miessler5einfo/) by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr

Chemical Applications of Group Theory (http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471510947.html) by F. Albert Cotton

Symmetry and Spectroscopy (http://store.doverpublications.com/048666144x.html) by Daniel C. Harris and Michael D. Bertolucci

These texts are on reserve at the King Library. They can also be checked out from Prof. Radlauer during office hours and borrowed until the next class period.

From LibreTexts: Organometallic Chemistry by Michael Evans (https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Organometallic_Chemistry_(Evans))
This is a free online textbook. I have never used it before, but I'd like to try it out as it seems like it will be a great resource for the course.

Library Liaison

You will need to use SciFinder and other databases to access the literature for this course. You should have a student library account with the King Library that allows you access the library electronic databases. If you plan to access the library services from off-campus, you may need to obtain a password and/or proxy to do so. Check the Library website for information. The reference Librarian for Chemistry is Anne Marie Engelsen and her email is annemarie.engelsen@sjsu.edu.

Course Requirements and Assignments

Graded work will include in-class worksheets and group work (100 points), problem sets (200 points), a midterm exam (200 points), prep work and participation in literature discussions (300 points), and a term paper (200 points), which all contribute to the course learning outcomes.

Relevant dates in the Course Schedule and will be posted to Canvas.

Course Organization

The course is organized into two sections. We will start with a more traditional course format including lecture/discussion, group work, problem sets, and a midterm. Then we will transition into reading the literature. The goal is for you to learn the necessary tools to feel comfortable with Organometallics literature and then to give you time for exploration of classic and modern examples of research in this field. In spending time practicing reading papers, I hope that you will build skills applicable beyond this course.

Missed Assignments

The difficult circumstances of the past >3 years have not gone away and I am aware that the havoc in our world has forced us to work and learn under various stressors. This may make it more difficult for you to maintain a steady schedule and you may need to miss class or an assignment at some point in the semester. If this is the case, please contact me ahead of class time and with as much of a heads up as possible and we can discuss the situation. The more heads up you can give me, especially with regards to missing exams or assignment deadlines, the better. Even if you cannot give me a heads up, reach out. I will do my best to be accommodating.

Grading Information

Breakdown

Points will be distributed as described in Course Requirements and Assignments above. I will not curve because I believe that everyone can succeed in this course. I may, at the end of the course, linearly shift the scale. I will only shift it to benefit you. The course grade will be determined from the resulting average of the point total as follows.

Grade	Range	Notes

Grade	Range	Notes
A plus	96 and above	
A	92 to 95.9	
A minus	88 to 91.9	
B plus	84 to 87.9	
B	80 to 83.9	
B minus	76 to 79.9	
C plus	72 to 75.9	
C	68 to 71.9	
C minus	64 to 67.9	
D plus	60 to 63.9	
D	50 to 59.9	
F	less than 50	

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

The tentative course calendar below includes weekly course content, exam dates, and the date for the final exam. Dates may be subject to change, but prior to this, fair notice will be given during class and through Canvas. The recommended reading and problems from our primary textbook, Inorganic Chemistry by Miessler, Fischer, and Tarr will be listed on the Canvas site along with each module. The related modules are indicated in bold as M1, M2, and M3.

When	Topic	Notes
Class 1, Week 1 M 8/21/23	First day of classes	introduction to the course and ligand types
Class 2, Week 1 W 8/23/23	Electron counting	strategies and practice, ways we spectroscopically and structurally characterize organometallic complexes
Class 3, Week 2 M 8/28/23	Ligand substitution	mechanisms and a great example of an application of electron counting
Class 4, Week 2 W 8/30/23	Kinetics experiments	how they help us determine the mechanism

When	Topic	Notes
no class M 9/4/23	Labor Day	
Class 5, Week 3 W 9/6/23	Ligand substitution	kinetics and trans effects
Class 6, Week 4 M 9/11/23	Oxidative addition	
Class 7, Week 4 W 9/13/23	Reductive elimination	
Class 8, Week 5 M 9/18/23	Migratory insertions	
Class 9, Week 5 W 9/20/23	Eliminations	
Class 10, Week 6 M 9/25/23	Reactions at ligands	Nucleophilic and electrophilic attack on ligands
Class 11, Week 6 W 9/27/23	Catalysis	defining “catalyst” and putting the fundamental reaction steps together into a catalytic mechanism, Part I
Class 12, Week 7 M 10/2/23	Catalysis	defining “catalyst” and putting the fundamental reaction steps together into a catalytic mechanism, Part II (end of material for midterm)
Class 13, Week 7 W 10/4/23	Literature	Paper #1
Class 14, Week 8 M 10/9/23	Literature	Paper #2
Class 15, Week 8 W 10/11/23	Midterm Exam	in-class midterm
Class 16, Week 9 M 10/16/23	Literature	Paper #3
Class 17, Week 9 W 10/18/23	Literature	Paper #4
Class 18, Week 10 M 10/23/23	Literature	Paper #5

When	Topic	Notes
Class 19, Week 10 W 10/25/23	Literature	Paper #6
Class 20, Week 11 M 10/30/23	Literature	Paper #7
Class 21, Week 11 W 11/1/23	Literature	Paper #8
Class 22, Week 12 M 11/6/23	Literature	Paper #9
Class 23, Week 12 W 11/8/23	Literature	Paper #10
Class 24, Week 13 M 11/13/23	Literature	Paper #11
Class 25, Week 13 W 11/15/23	Literature	Paper #12
Class 26, Week 14 M 11/20/23	Literature	Student's choice #1
no class W 11/22/23	Thanksgiving break	
Class 27, Week 15 M 11/27/23	Literature	Student's choice #2
Class 28, Week 15 W 11/29/23	Literature	Student's choice #3
Class 29, Week 16 M 12/4/23	Literature	Student's choice #4
Class 30, Week 16 W 12/6/23	Literature	Student's choice #5
T 12/12/23	Term Paper	Our assigned final exam time is 2:45-5 pm on 12/12, so I will use 5 pm as the deadline for your term papers.