INORGANIC SYNTHESIS

Colorful | Techniques | Instrumentation | Applications

Contact info

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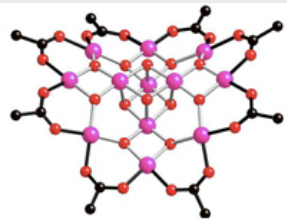
Office Hours:
Mon 1 -3 pm
Wed 11:30 am -1 PM
Thurs during and after lab!

Course Materials

No required text
Handouts
Primary literature articles
Reserve Materials
Lab notebook (can use one from a previous course)

Course Times

M 10:20 am - 11:20 am



Inorganic synthesis is a laboratory course designed to introduce you to some of the techniques for the synthesis and characterization of inorganic compounds. You should think of this class as a scientific learning community—you will learn information relevant to your own project (or other assignments that I give you!) and share that information with the rest of the class. In this course you will gain hands-on exposure to more sophisticated laboratory techniques in inorganic chemistry and integrate them in multi-step syntheses. You will explore a variety of interesting sophisticated synthetic techniques such as using a dual-manifold vacuum line and glove box for manipulation of air-sensitive samples. You will characterize the products using a variety of analytical methods such as NMR, IR, and UV-Vis spectroscopies, conductivity, electrochemistry, thermal analysis, and magnetic susceptibility measurements. In certain cases other techniques will be possible through collaborations with faculty at Wabash, IU, and Purdue.

One of the main goals of this course is to develop a comfort level with use of the primary chemical literature on the synthesis and characterization of inorganic compounds. We will practice searching the chemical literature and picking apart and present articles from the literature. You will also write up lab results in a method consistent with that same literature. The course will give you experience in using the chemical literature to design your own synthesis project.

Goals for the course

By the end of the course, students should be able to:

1. Master the use of modern instrumentation for characterization of inorganic compounds, such as NMR, IR, and UV-Visible spectroscopy, chromatography, magnetochemistry, and electrochemistry.

2. Describe what information each of the methods above can provide about an inorganic compound, and interpret experimental results based on that knowledge.

3. Manipulate compounds in an air- and/or water-free environment

4. Gain proficiency in several of the following experimental techniques ranging from glove box work, vacuum distillation, Schlenk line manipulations, sublimation, optical purification.

5. Use the Cambridge Structural Database to find useful structural and comparative information about inorganic compounds.

6. Repeat a literature synthesis with minimal input from the instructor.

7. Recognize places to build on the research of a previous author (and possibly carry them out).

8. Present the results of your research to the class in an appropriate scientific format.

Grading Policies

The grading for the course is broken into the following areas:

•3 Short Lab Reports: 15% each

•Lab notebook/participation: 5%

•Final Synthesis Project and Presentation: 30%

•Short Class Presentations, In Class Activities, and Homework: 20%

Detailed information for each assignment will be provided.

Laboratory Notebook

You will be required to keep a laboratory notebook and I will take a look at it and give feedback periodically during lab. While I will not enforce a particular lab notebook format in this course, you should write it so that someone else could repeat your experiments and get the same results. This includes *providing copies of all spectroscopic and analytical data that you obtain on your compounds* as part of your notebook. It also includes noting if you think something went wrong, and if so, where you think it did. Sometimes this information is more valuable than any success that you record in you notebook! If you have any questions about keeping your notebook, just ask—I am assuming you already have a lot of experience with this!

Course Outline

The course website contains a summary of up to date week by week schedule and links to readings on e-reserves or in the primary literature. URL will provided shortly. A general outline is provided on the next page.

Late Days

All assignments (reading, homework, writing and exams) are to be turned in during the class that they are due.

You have three "late days" which you may use as needed during the semester, as long as you notify me in advance. For instance, if an assignment is due on a Monday, but you have a big exam on Monday, you can use a late day and turn that assignment in on Tuesday. Please note, however: a "day" is twenty-four hours long, and ends at 5.00 pm. If you don't give me the assignment until Wednesday morning, that counts as two late days. Please note that because these late days are freebies, I will give no extensions.

Any late days beyond these three days (or lateness without prior notification) will count against your grade. Late work is subject to 10% penalty per day.

Academic Honesty

Learning is frequently greater if you can work with others in a class to master the material. Your lab reports will require the assembly of information from multiple sources. Sources of material should be properly cited and you should take care not to plagiarize from those outside sources. If you are ever unclear about how an assignment is to be completed, please ask me! The penalties for academic dishonesty are outlined in the Student Handbook:

www.depauw.edu/handbooks/academic/policies/integrity/

Course Outline

Note that this schedule is subject to change as the semester evolves! Exact schedule is provided on the course website.

Week 1 Check in, safety, syllabus

Week 2 Using the literature, Coordination Chemistry Synthesis

Week 3 Dissecting an inorganic synthesis, Coordination Chemistry synthesis (con't)

Week 4 UV/Vis, IR, and magnetic susceptibility, Solid State Chemistry Synthesis

Week 5 NMR Spectroscopy and electrochemistry of inorganic compounds,

Week 6 X-ray and other solid state techniques, Solid State Chemistry Synthesis (con't)

Week 7 Air sensitive manipulations I, Organometallic Synthesis

Week 8 Air sensitive manipulations 2, Organometallic Synthesis (con't)

Week 9 Writing a research proposal, Projects

Week 10 Individual meetings on Project, Project (con't)

Week 11 Progress reports, Project (con't)

Week 12 Projects

Week 13 Presentations

What's With The Snakes? And What Does It Have To Do With You?

IONiC and VIPEr: I am a founding member of IONiC: the Interactive Online Network of Inorganic Chemists. We have funding from the National Science Foundation to forge a community of practice for the teaching of inorganic chemistry and develop an on-line resource for the inorganic chemistry community (http://www.ionicviper.org).

Periodically, you will see "learning objects" that are marked with some reference to VIPEr. These are teaching materials developed by my collaborators and/or me that I am adapting and testing. I may post feedback on VIPEr to inform the author and other users, but rest assured that any comments I make will not identify individual students.

You may periodically get a chance to interact with other members of IONiC or VIPEr (or outside speakers) as we work our way through assignments in this course!