

Chemistry 2310

Advanced Inorganic Chemistry – Organometallic Chemistry

(GC 349, TTh 10:30-11:50 am)

Description: This course intends to help students understand structures and reactions of transition metal complexes with common organic ligands (organometallic complexes). It starts with the 18-electron rule commonly applied in organometallic chemistry to explain the structure and reaction pathways. It then describes the structure and properties of transition metal complexes with carbonyl and other common organic ligands. It summarizes the unique chemical reactions initiated by metal-organic bonding interactions, including *ligand substitution*, *oxidative addition/reductive elimination*, *insertion/deinsertion*, *nucleophilic addition/abstraction*, and *electrophilic reactions*. Important catalyses based on organometallic complexes for syntheses of functional materials are also highlighted.

Textbook: Organometallic Chemistry (2nd Edition), Gary Spessard and Gary Miessler, Oxford University Press, 2010.

Other reference: The Organometallic Chemistry of the Transition Metals (6th Edition), Robert Crabtree, Wiley, 2014.

Topics	
1. Introduction	
2. The 18 Electron Rule	
3. Metal Carbonyls	
4. Other Metal-Organic Complexes (M-alkyls (hydrides), M-olefins, M-carbenes (carbynes))	
Mid-Term Exam (30%)	Oct 16
5. Reactions at Metal Centers (<i>Ligand substitution; oxidative addition and reductive elimination</i>)	
6. Reactions Involving Ligands (<i>Insertion and deinsertion; Nucleophilic addition/abstraction; Electrophilic reactions</i>)	
7. Applications: Catalysis and Organic Synthesis	
Student Presentations (20%)	Dec 2,4
Reading Period	Dec 7-11
Term paper (10%)	Due by Dec 7
Final Exam (40%)	