

UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS
WINTER 2013

COURSE: CHEMISTRY 531 – Advanced Inorganic Chemistry I

LEC	DAYS	TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	MWF	10:00-10:50	EEEL349	Dr. Shimizu	SB 403	220-5347	gshimizu@ucalgary.ca	TuW 12-1

TEXTBOOK: *None required* Chem 331 and 333 texts (Housecroft, Huheey) will be beneficial as well as R. Crabtree, 2005, *The Organometallic Chemistry of the Transition Metals*, 4th (or 3rd) Ed.

TOPICS COVERED:**A. Organometallic Chemistry**

Review- Molecular Orbital (MO) Theory and Oh complexes with σ -/ π -donor ligands
Electron counting/Ligand survey
18 electron rule

Complexes with multiple M-M bond

C \equiv O bond strength in carbonyl complexes
Hydride complexes and spectroscopy; Di-hydrogen as ligand
Phosphines: Steric and Electronic Effects
Multinuclear NMR

Nitrosyl Complexes; Alkyl & Aryl Ligands

π -Bonded Organic Ligands: Alkenes & Alkynes, Allyls, 1,3-Butadiene & Cyclobutadiene, Arenes & Cyclopentadiene
Schrock Carbenes (Alkylidenes); N-Heterocyclic Carbenes (NHCs)

B. Organometallic Reactions at Metal Centers

Ligand Substitution Reactions in Organometallic Complexes
Ligand Substitution Reactions in Metal Carbonyl Complexes
Oxidative Addition
Oxidative Coupling/ Reductive Elimination
Alkyl / Hydride Migratory Insertion; β -Hydride elimination;
Catalysis; Catalytic Cycle; Heterogeneous vs. Homogeneous Catalysis
Alkene Hydrogenation; Hydroformylation
Monsanto Synthesis; Alkene Oligomerization; Alkene & Alkyne Metathesis

Stille, Suzuki, Heck Coupling Reactions; Heterogeneous Catalysis**Solid Acid Catalysts; Applications of Heterogeneous Catalysis: Catalytic Reforming; Catalytic Converters****Haber-Bosch Process; Catalysts for Polymerization of Olefins****C. Inorganic Materials**

Metal oxide structures
Methods of solid state characterization
Electronic conduction
Ionic conduction
Porous Solids
Metal organic frameworks