

CHEM5560 Organometallic Chemistry and Catalysis

Course Description:

Catalysis is a cutting-edge science and plays a central role in modern organic synthesis. Enjoying the modification of the ligand, the activity of the transition metal complex can be manipulated to fit specific catalysis. This course will give students an in-depth understanding of catalyst structures via organometallic and organic chemistry approaches, and how those catalysts (transition metal complex) can be applied in sustainable and complex chemical synthesis. The industrial applications of some tailor-made catalysts will also be discussed. In this course, student presentation of current frontier catalysis is required.

Main Course Outline (for reference only):

1. Background of transition metal complexes, crystal field, ligand field and back bonding concepts
2. General properties of organometallic complexes
3. Metal-carbon and metal-hydrogen bonds
4. Ligand substitution reactions
5. Complexes of pi-bound ligands
6. Oxidative addition and reductive elimination reactions
7. Insertion and elimination pathways
8. Concept of homogenous catalysis, alkene isomerization, hydrogenation and hydroformylation
9. Current catalysis of aromatic carbon-carbon and carbon-heteroatom bond formations
10. Project presentation on current catalysis