



Transition Metal Organometallic Chemistry: Principles to Applications

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PRE-REQUISITES : UG General Chemistry.

INTENDED AUDIENCE : All of Chemistry and possibly some of Chemical Engineering students.

INDUSTRIES APPLICABLE: Reliance, Dupont, BASF, BAYER, DOW Chemicals

COURSE OUTLINE :

This course would cover all aspects of Organometallic Chemistry, starting from the principles to its applications.

ABOUT INSTRUCTOR :

Prof. Prasenjit Ghosh is a Professor of Inorganic Chemistry at Indian Institute of Technology Bombay (IIT Bombay), India. He received his PhD in bioinorganic chemistry under the supervision of Professor Gerard Parkin from Columbia University, New York, in 1998. Following two post-doctoral stints in the laboratories of Dr. R. Morris Bullock (Brookhaven National Laboratory, 1998-2001) and Professor Guillermo C. Bazan (University of California, Santa Barbara, 2001-2003), he joined the Department of Chemistry at IIT Bombay as an Assistant Professor in 2003 and was finally promoted to Professor in June, 2012. He received the CRSI Bronze Medal (2014) of the Chemical Research Society of India and The Distinguished Lectureship Award (2011) of the Chemical Society of Japan among many others in the recent years. He is an Editorial Advisory Board member of the ACS journal Organometallics from 2017 for a three-year period and of Polyhedron since 2011.

COUSE PLAN:

Week 1 :

Lecture 1: History of Organometallic Compounds,

Lecture 2: Polarity and Reactivity of M-C bond

Lecture 3: Reactivity of Organometallic Compounds

Lecture 4: Reactivity of Organometallic Compounds (contd...)

Lecture 5: 18 Valence Electron Rule and Classification

Week 2 :

Lecture 6: 18 Valence Electron Rule and Classification

Lecture 7: Reactivity and types of Organometallic compounds

Lecture 8: sigma- Donor ligands

Lecture 9: Preparation of sigma- alkyl compounds

Lecture 10: Preparation and Properties of sigma- alkyl compounds

Week 3 :

Lecture 11: Properties of sigma- alkyl compounds

Lecture 12: β -elimination in sigma- alkyl compounds

Lecture 13: β -elimination in detail

Lecture 14: TM sigma- alkyl complexes and its application

Lecture 15: TM sigma- alkyl complexes and its application (contd...)

Week 4 :

Lecture 16: C-H activation

Lecture 17: C-H activation in details

Lecture 18: C-H activation in details (contd...)

Lecture 19: Characterization of C-H activation

Lecture 20: Bonding in C-H activation

RSE PLAN :

Week 5 :

Lecture 21: C–C Bond activation

Lecture 22: C–C Bond activation (contd...)

Lecture 23: C–C Bond activation in Details

Lecture 24: Transition Metal Perfluoroalkyl (RF–TM) Complexes

Lecture 25: Preparation of Transition Metal Perfluoroalkyl (RF–TM) Complexes

Week 6 :

Lecture 26: C–F Activation

Lecture 27: Transition Metal Alkenyl/Aryl Complexes

Lecture 28: Transition Metal Aryl Complexes

Lecture 29: Transition Metal Aryl/Alkyne Complexes

Lecture 30: Transition Metal Alkyne/Carbene Complexes

Week 7 :

Lecture 31: Transition Metal Carbene Complexes: Preparations

Lecture 32: Transition Metal Carbene Complexes: Properties

Lecture 33: Transition Metal Carbene Complexes: Reactivities

Lecture 34: Transition Metal Carbene Complexes: Reactivities (contd...)

Lecture 35: Transition Metal Carbene Complexes: Reactivities (contd...)

Week 8 :

Lecture 36: Transition Metal Carbene Complexes: Reactivities (contd...)

Lecture 37: Reactivity of Schrock type Carbene Complexes and Transition Metal Carbynes

Lecture 38: Transition Metal Carbynes: Preparation

Lecture 39: Transition Metal Carbynes: Properties

Lecture 40: Transition Metal Carbynes: Properties (contd...)

Week 9 :

Lecture 41: Properties of Transition Metal Carbynes And Transition Metal Carbonyls

Lecture 42: Transition Metal Carbonyls

Lecture 43: Transition Metal Carbonyls (contd...)

Lecture 44: Transition Metal Carbonyls: Bonding properties

Lecture 45: Transition Metal Carbonyls: Bonding properties (contd...)

Week 10 :

Lecture 46: Transition Metal Carbonyls: Reactivities

Lecture 47: Transition Metal Carbonyls: Reactivity and Carbonyl Metallates

Lecture 48: Transition Metal Carbonyl Hydrides

Lecture 49: Application of Carbonyl Metallates and Metal Halides

Lecture 50: Application of Metal Halides and Metal Alkenes

Week 11 :

Lecture 51: Transition Metal Olefin Complexes

Lecture 52: Transition Metal Olefin Complexes (contd...)

Lecture 53: Transition Metal Olefin Complexes: Reactivity

Lecture 54: Bonding Properties in Olefin Complexes

Lecture 55: Transition Metal Diolefin Complexes

Week 12 :

Lecture 56: Transition Metal Diolefin and Alkyne Complexes

Lecture 57: Transition Metal Alkyne Complexes

Lecture 58: Transition Metal Alkyne Complexes: Reactivity

Lecture 59: Transition Metal Alkyne Complexes: Reactivity (contd...)

Lecture 60: Summary: Transition Metal Organometallic Chemistry: Principles to Applications