

Introduction to Organometallic Chemistry - Web course

COURSE OUTLINE

Organometallic compounds of *s*- and *p*-block elements; structure and bonding aspects of main group elements: Lewis structure, VSEPR theory, Bent's rule, steric numbers, molecular shapes; methods of preparation of organometallic compounds; reactivity of organometallic compounds; Zeigler-Natta polymerization catalysts; classification of ligands; phosphines; organometallic compounds of zinc, cadmium and mercury.

Organometallic transition metal complexes; the 18 Valence Electron Rule; synthesis and stability, transition metal alkyls, hydrides, carbonyls, phosphines, alkene, allyl, diene and the cyclopentadienyl complexes; oxidative additions and reductive eliminations; insertion and elimination reactions; nucleophilic and electrophilic addition and abstraction reactions; application in homogeneous catalysis.

COURSE DETAIL

Module No.	Topics
Prof. M. S. Balakrishna	
1.	INTRODUCTION
	1. Bonding concepts in main group chemistry 2 & 3: VSEPR theory and its utility
2.	Organometallic chemistry of <i>s</i>- and <i>p</i>-block elements
	1: General Methods of preparation 2: Organometallic compounds of alkali metals (sodium and lithium) 3: Organometallic compounds of alkaline earth metals (beryllium and



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Chemistry and Biochemistry

Pre-requisites:

- B.Sc. (PCM) or B.Sc. with chemistry as a major subject;
- completed 12th grade with CBSE syllabus (clear understanding of the basic aspects of chemistry with motivated to learn chemistry).

Coordinators:

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Prof. Prasenjit Ghosh
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	magnesium) 4: Structure and bonding aspects.
3.	Organometallic chemistry of p-block elements
	1: Reactions of organometallic compounds. 2: Organometallic compounds of boron and aluminium. 3: Organometallic compounds of gallium and indium 4: Ziegler Natta polymerization catalysts 5: Organosilicon and organogermanium compounds 6: Organotin and organolead compounds
4.	Organoelement compounds of Group 15
	1: Organometallic compounds of As(V) and Sb(V) 2: Organometallic compounds of As(III) and Sb(III) 3 & 4: Phosphines
5.	Group 12 elements
	1: Organometallic compounds of zinc and cadmium 2: Organometallic compounds of mercury
Prof. Prasenjit Ghosh	
6.	General properties of Transition Metal Organometallic Complexes
	1: 18 Valence Electron Rule 2: Synthesis and Stability
7.	Metal alkyls and Metal hydrides
	1: Transition metal alkyl complexes 2: Metal Hydrides

8.	Carbonyls and Phosphine Complexes
	1: Metal carbonyls> 2: Metal Phosphines
9.	Complexes of π-bound ligands
	1: Metal alkene complexes 2: Metal allyl and diene complexes 3: Metal cyclopentadienyl complexes
10.	Reaction mechanism
	1: Oxidative addition and Reductive elimination 2: Insertion and Elimination Reactions 3: Nucleophilic and Electrophilic Addition and Abstraction
11.	Applications
	1: Homogeneous Catalysis - I 2: Homogeneous Catalysis - II
12.	Physical methods in Organometallic Chemistry
	1: Characterization of Organometallic Complexes
13.	Multiply bonded ligands
	1: Metal-Carbenes 2: Metal-Carbynes
14.	Metathesis
	1: Catalytic Applications of Organometallic Compounds: Alkene Metathesis

References:

1. Inorganic Chemistry, Principles of structure and reactivity, 4th edition;1993, J. E. Huheey, E. A. Keiter, R. L. Keiter, Addison-Wesley Publishing Co, New York.
2. Advanced Inorganic Chemistry, 6th edition, 1999, F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, John Wiley and Sons, New York.
3. Organometallics, A Concise Introduction, 2nd edition (revised), 1992, Ch. Elschenbroich, A. Salzer, Weinheim, Germany.
4. Organometallics by Christoph Elschenbroich, Third edition, 2006, Wiley-VCH Verlag GmbH & Co, KGaA, Weinheim, Germany.
5. The organometallic chemistry of the transition metals by Robert H Crabtree, Third edition, 2001, John Wiley & Sons, Inc.
6. Inorganic Chemistry, 3rd Edition, 1999, D. F. Shriver, P. W. Atkins, Oxford University Press, Oxford.
7. Inorganic Chemistry, 2nd Edition, 2005, C. C. Housecroft and A. G. Sharpe, Pearson, Prentice Hall, England.