

4. [Textbook of Dyes - A. Arora](#)(Sonal Publications) 2009.
5. Synthetic Dyes – Vol-I – Venkataraman, 1999.
6. Synthesis and Chemistry of Agrochemicals, Vol I & II, ACS, Washington.
7. Chemicals for Crop Protection and Pest Managements, M B Green, G.S. Hartley West, Pergamon.
8. Chemistry of Insecticides and Fungicides, Sree Ramulu, Oxford & IBH, 1985.

OC S 555: Separation Techniques and Organometallic Chemistry

COURSE OUTCOME:

- The students will learn the theory, principle, analytical and industrial applications of column chromatography, paper chromatography, thin layer chromatography, gas chromatography and High performance liquid chromatography.
- The student will gain the knowledge about types, routes of synthesis and reactions of transition metal alkyls, carbenes, carbynes and hydrides.
- The student will understand the preparative methods, bonding, structure of transition metal-carbon pi-complexes, catalysis by organometallic compounds,
- To study homogeneous catalysis by organometallics in hydrogenation, hydrosilylation, hydrocyanation, isomerisation of olefins, hydrocarbonylation of olefins, polymerization of olefins and acetylenes, synthetic applications of organocuprates, hydrozirconation, transmetallation by organonickels and carbonylation by metal carbonylates.

UNIT- I:

[12 Hours]

Column Chromatography (CC): Construction and operation of column, choice of adsorbents and eluents, techniques of elution, methods of detection, analytical and industrial applications.

Paper Chromatography (PC): Definitions, theory and principle, techniques; one, two-dimensional and circular PC, mechanism of separation, structure of cellulose and types of paper, methodology, preparation of sample, choice of solvents, location of spots and measurements of RF value, factors affecting RF values, advantages and applications.

Thin Layer Chromatography (TLC): Definition, mechanism, efficiency of TLC plates, methodology selection of stationary and mobile phases, preparation of plates. Spotting, development, identification and detection, reproducibility of RF values, comparison of TLC with high performance thin-layer chromatography, paper chromatography and column chromatography. Qualitative and quantitative analysis.

UNIT- II:

[12 Hours]

Gas chromatography (GC): Principle, comparison of GSC and GLC, instrumentation columns pack and tubular, study of detectors-thermal conductivity. Flame ionization, electron capture and mass spectrometry. Factors affecting the separation, applications.

High Pressure Liquid Chromatography (HPLC): Apparatus, pumps, column packing, characteristics of liquid chromatographic detectors-UV, IR, refractometer and fluorescence detectors, advantages and applications.

Organometallic Compounds: Transition metal alkyls and aryls- types, routes of synthesis, Nucleophilic and electrophilic cleavage of metal-carbon sigma bonded compounds. Alkane

activation. Transition metal to carbon multiple-bonded compounds- carbenes, carbynes, synthesis, structural characteristics and reactivity. Transition metal hydrides – synthetic

routes, properties, structure and reactivity, synthetic applications.

UNIT - III:

[12 Hours]

Transition metal-carbon pi complexes: Preparative methods, nature of bonding, structural features of olefinic, acetylenic, allylic and η^5 -cyclopentadienyl and η^6 -benzene complexes. Important reactions relating to nucleophilic and electrophilic attack on ligands.

Catalysis by organometallic compounds: 16- and 18-electron rules, oxidative addition, insertion, deinsertion and reductive elimination reactions.

Homogeneous catalysis by organometallics: Hydrogenation, hydrosilation, hydrocyanation and isomerization of olefins, immobilisation of homogeneous hydrogenation catalysts, hydrocarbonylation of olefins (oxo reaction-cobalt and rhodium oxo catalysts), carbonylation of alcohols-Monsanto acetic acid process. **Polymerization of olefins and acetylenes:** Ziegler-Natta catalyst systems. Fischer-Tropsch reaction, Water Gas Shift reactions.

Synthetic applications of organocuprates. Hydrozirconation, transmetallation reactions by organonickels, carbonylation by metal carbonylates.

References:

1. Chromatography-E. Heftman (Ed), Part A and Part B, 5th ed. Elsevier, 1992.
2. Chromatography Today- D. F. Poole and S.K. Poole, Elsevier, 1991.
3. Principles of Instrumental Analysis-Skoog, Holler and Nieman, 5th ed. Saunders, 1998
4. Quantitative Analysis-R. A. Day and A. L. Underwood, 5th ed. Prentice-Hall, 1998.
5. Instrumental Methods of Chemical Analysis -B. K. Sharma, 19th ed, Goel, 2000.
6. Principles and Applications of Organotransition Metal Chemistry - J.P.Collman, L.S.hegedus, J.R.Norton and R.G.Finke (University Science Books) 1987.
7. Organometallic Chemistry - R.C.Mehrotra and A.Singh (New Age International) 1999.
8. Organometallic Chemistry of Transition Metals-R.H.Crabtree (Wiley) 1999.

OC S 556: Organic Synthetic Strategies and Petrochemicals

COURSE OUTCOME:

Enable the students:

- To understand the preparation, properties and uses of polymer supported reagents in organic synthesis such as oligosaccharides, Dieckmann cyclisation, Aldol, Wittig, etherification, acetal formation and diazotransfer reactions.
- To gain the knowledge of mechanistic aspects of nine multicomponent reactions, asymmetric synthesis by employing chiral pool, chiral auxiliaries, chiral reagent and chiral catalysts.
- To learn the origin, formation and composition of petroleum, petroleum refining, reforming, fractionation, cracking, petroleum products and their applications,
- To learn manufacture of synthetic petrol, origin of coal, coal carbonization, coal gasification and coal tar based chemicals, coal conversions and manufacture of petrochemicals.

UNIT- I:

[12 Hours]