SCH 301: Coordination and Organometallic Chemistry

Course Outline

1. Transition and non-transition metal ions
2. Definitions
    - Lewis base
    - Lewis acid
    - Coordinate bond
    - Ligand
    - Coordination number
    - Coordination compound
    - Organometallic compound
3. Types of ligands
    - Anionic, neutral and cationic ligands
    - Monodenate, bidentate and polydentate ligands
    - π-acid and non π-acid ligands and stabilization of various oxidation states
    - Hard and soft acids and bases and their applications
4. Nomenclature of coordination complexes
    - The effective atomic number and the 18-electron rule
    - Rules of nomenclature of coordination complexes
5. Common structures
    - Isomerism
6. Bonding in coordination complexes
    - Valence bond theory and its limitations (VBT)
    - The crystal field theory (CFT)
        - Splitting of *d*-orbitals in octahedral, tetrahedral and tetragonal environments
        - The spectrochemical series of ligands
        - Usefulness and limitations of CFT
        - Thermodynamic and magnetic properties transition metal compounds
        - Electronic spectra of transition metal compounds
7. Organometallics
    - Types of organometallic compounds
    - Preparation of organometallic compounds
    - Bonding in organometallic compounds
    - Reactivity and uses of organometallic compounds in catalysis as illustrated by selected examples
8. Coordination compounds in medicine

Practicals: Shall involve synthesis and characterization of selected coordination complexes.

Textbooks and Journals for the course

1. Lee, J.D. *Concise Inorganic Chemistry,* 5th Ed Chapter 7, and Blackwell Science Ltd.
2. Greenwood, N.N., Earnshaw, A. *Chemistry of the elements 2nd or 3rd Ed., Butterworths Heinemann, Chapter 19*
3. McMurry, J. and Fay, R.C. ,Chemistry, 3rd, 4th Edn, Prentice Hall, 2001
4. Cratree R. H., The organometallic Chemistry of transition elements, 4th Edn, Wiley-Interscience, 2005
5. Huheey, J.E., Keiter, E.A. and Keiter, R.L. (1993). *Inorganic Chemistry Principles of structure and reactivity* (5th Ed) New York: Harper Collins College Publishers
6. Jolly, W.L. (1991) *Modern Inorganic Chemistry*. New York: McGraw-Hill Book Company,.
7. Rodgers, G.E. (2002) Descriptive Inorganic, Coordination and Solid State Chemistry (2nd Ed) Brooks /Cole
8. Inorganic Chemistry 1993, 32, 1
9. Russian Journal of Coordination Chemistry 2003, 29, 53
10. www