Subject Code : P8CH2

CORE COURSE II - INORGANIC CHEMISTRY I

UNIT – I

1. Main Group Chemistry

Chemistry of boron – borane, higher boranes, carboranes, borazines and boron nitrides. Chemistry of silicon – silanes, higher silanes, multiple bonded systems, disilanes, silicon nitrides, siloxanes and silicates. P-N compounds, cyclophosphazenes and cyclophosphazanes. S-N compounds – S_4N_4, $(SN)_x$.

2. Ionic Model

Lattice energy – Born-Lande equation - Kapustinski equation - High T_c superconductors – Solid state reactions – Types and examples.

UNIT II

3. Coordination Chemistry: Principles

Studies of coordination compounds in solution – detection of complex formation in solution – Stability constants – stepwise and over-all formation constants – simple methods (Potentiometric, pH metric and photometric methods) of determining the formation constants - Factors affecting stability – statistical and chelate effects – Forced configurations.

UNIT III

4. Theories of Metal - Ligand bond

VB theory and its limitations – Crystal field theory - splitting of d-orbitals under various geometries – Factors affecting splitting – CFSE and evidences for CFSE (Structural and thermodynamic effects) – Spectrochemical series – Jahn-Teller distortion – Spectral and magnetic properties of complexes – Site preferences - Limitations of CFT – Ligand field theory – MO theory – sigma – and pi-bonding in complexes – Nephelauxetic effect – The angular overlap model.

UNIT – IV

5. Coordination Chemistry – Reaction Mechanism

Kinetics and mechanism of reactions in solution – labile and inert complexes – Ligand displacement reactions in octahedral and square planar complexes – acid hydrolysis, base hydrolysis and anation reactions – trans effect – theory and applications. Electron transfer reactions – electron exchange reactions – complementary and non-complementary types – inner sphere and outer sphere processes – Application of Electron transfer reactions in inorganic

- isomerisation and racemisation reactions of complexes – Molecular rearrangement – Reactions of four and six-coordinate complexes – Interconversion between stereoisomers. Reactions of coordinated ligands – Template effect and its application for the synthesis of Macrocyclic ligands – Unique properties.

UNIT – V

6. Inorganic Photochemistry

Electronic transitions in metal complexes, metal-centered and charge-transfer transitions – Various photophysical and photochemical processes of coordination compounds – Unimolecular charge-transfer photochemistry of cobalt (III) complexes. Mechanism of CTTM photoreduction. Ligand-field photochemistry of chromium(III) complexes, Adamson's rules, photoactive excited states, V-C model – photophysics and photochemistry of ruthenium-polypyridine complexes, emission and redox properties – photochemistry of organometallic compounds, metal carbonyl compounds, compounds with metal-metal bonding Reinecke's salt chemical actinometer.

References

1. M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Affiliated East West Press Pvt. Ltd. 2nd ed.,1985.
1. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, 4th ed., A Wiley - Interscience Publication, John –Wiley & Sons, USA.
2. J.E. Huheey, Inorganic Chemistry 3rd. ed., Harper & Row publisher, Singapore.
3. A.W.Adamson, Inorganic Photochemistry, John Wiley & Sons, New York.
4. S.F.A. Kettle, Physical Inorganic Chemistry – A Coordination Chemistry Approach, Spectrum
5. Academic Publishers, Oxford University Press, 1996.
6. A. W. Adamson and P. D. Fleischauer, Concepts of Inorganic Photochemistry, Wiley,
7. New York, 1975.
8. J. Ferraudi, Elements of Inorganic Photochemistry, Wiley, New York, 1988.
9. F.Basolo and R.G.Pearson, Mechanism of Inorganic Reactions, John Wiley, New York.