

CHN – 604 (B) Photoinorganic Chemistry

Photoinorganic Chemistry

60 Hrs (2 Hrs/week)

I Basics of Photochemistry

10 Hrs

Absorption, excitation, photochemical laws, quantum yield, electronically excited states-life times-measurements of the times. Flash photolysis, stopped flow techniques. Energy dissipation by radiative and non-radiative processes, absorption spectra, Franck-Condon principle, photochemical stages – primary and secondary processes

II Properties of Excited States

10 Hrs

Structure, dipole moment, acid-base strengths, reactivity. Photochemical kinetics-calculation of rates of radiative processes. Bimolecular deactivation – quenching

III Excited States of Metal Complexes

8 Hrs

Excited states of metal complexes: comparison with organic compounds, electronically excited states of metal complexes, charge-transfer spectra, charge transfer excitations, methods for obtaining charge-transfer spectra.

IV Ligand Field Photochemistry

8 Hrs

Photosubstitution, photooxidation and photoreduction, lability and selectivity, zero vibrational levels of ground state and excited state, energy content of excited state, zero-zero spectroscopic energy, development of the equations for redox potentials of the excited states.

V Redox Reactions by Excited Metal Complexes

16 Hrs

Energy transfer under conditions of weak interaction and strong interaction-excimer formation; conditions of the excited states to be useful as redox reactants, excited electron transfer, metal complexes as attractive candidates (2,2'-bipyridine and 1,10-phenanthroline complexes), illustration of reducing and oxidising character of Ruthenium²⁺(bipyridal complex, comparison with Fe(bipy)₃; role of spin-orbit coupling-life time of these complexes. Application of redox processes of electronically excited states for catalytic purposes, transformation of low energy reactants into high energy products, chemical energy into light

VI Metal Complex Sensitizers

8 Hrs

Metal complex sensitizer, electron relay, metal colloid systems, semiconductor supported metal or oxide systems, water photolysis, nitrogen fixation and carbon dioxide reduction

Books Suggested

1. Concepts of Inorganic Photochemistry, A.W. Adamson and P.D. Fleischauer, Wiley.
2. Inorganic Photochemistry, J. Chem. Educ., vol. 60, no. 10, 1983.
3. Progress in Inorganic Chemistry, vol. 30, ed. S.J. Lippard, Wiley.
4. Coordination Chem. Revs., 1981, vol. 39, 121, 131; 1975, 15, 321; 1990, 97, 313.
5. Photochemistry of Coordination Compounds, V. Balzani and V. Carassiti, Academic Press.
6. Elements of Inorganic Photochemistry, G. J. Ferraudi, Wiley.