

CH3103: Transition and Inner-Transition Elements (4 credits: 3-1-0)

Theories of Bonding: VBT and its limitations, CFT; Splitting of d orbitals in crystal fields of different symmetry for similar and dissimilar ligands (Octahedral, tetrahedral, Linear, trigonal planar, trigonal bipyramidal, square pyramid), crystal field stabilization energies (CFSE) and pairing energy, spectrochemical series, JT-distortion, Low spin and high-spin complexes. Thermodynamic aspects of crystal field splitting (variation of ionic radii, lattice energy, hydration enthalpy and stability constants of complexes –Irving Williams order). Kinetic aspects of crystal field stabilization: crystal field activation energy, labile and inert complexes. Nephelauxetic series. Limitation of CFT. LFT. Molecular Orbital Theory, MO of diatomic and polyatomic molecules (N_2 , CO, BeH_2 , H_2O , B_2H_6 , octahedral, tetrahedral and square planar complexes).

Electronic Spectra: d-d transitions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra.

Magnetism: Types, determination of magnetic susceptibility, spin-only formula, spin-orbit coupling, spin crossover.

Lanthanides and Actinides: Contraction, coordination, optical spectra and magnetic properties, redox chemistry, analytical applications.

Text Books/Reference:

1. James E. Huheey, Inorganic Chemistry - Principles of Structure and Reactivity, 4th Edition, Pearson Education, 2006.
2. Stephen J. Lippard and Jeremy M. Berg, Principles of Bioinorganic Chemistry, 2nd Edition, Panima Publishing Corporation, 2005.
3. Cotton and Wilkinson Advanced Inorganic Chemistry, Wiley Eastern, 1976.
4. D. F. Shriver, P. W. Atkins and C. H. Langford, Inorganic Chemistry, Oxford University Press, 1990.
5. Inorganic Chemistry by J. D. Lee.