

ELECTRO ORGANIC CHEMISTRY

UNIT I

Basic concepts of electro organic synthesis:

Introduction, fundamental aspects of electro transfer reaction : oxidation, reduction reactions vs electron transfer reactions in organic chemistry and electrochemistry - Standard potentials : Mechanism and theory of outer sphere electron transfer reactions – Fundamental aspects of electrode phenomena, monitoring a half-reactions, general view of an electrode reaction, adsorption phenomena – Mass transfer in electro chemistry, fundamental aspects, steady state electrochemical methods, Transient electrochemical methods.

UNIT II

Methods for studies of electrochemical reactions :

Introduction, linear sweep voltammetry and cyclic voltammetry, Experimental setup, simple electrotransfer reaction, electron transfer reaction followed by chemical reaction and solutions, limiting experimental factors – potential step and current step method, chronoamperometry, chronocoulometry, chronopotentiometry – polarography – methods for determination of number of electrons.

UNIT III

Cathodic reductions :

Introduction, formation of radical anions, dianions and polyanions, experimental aspects, thermodynamics kinetics, addition of electrophilic reagents and related reaction, dimerization.

Electrochemical reduction of halogenated compounds : monohalogenated alkanes, halogenated aromatic compounds, acyl halides, aliphatic alpha – halo carbonyl compounds, cathodic reduction of nitro and related compounds, Aliphatic nitro compounds, aromatic nitro compounds(preparation of para amino phenol nitrobenzenes, nitramines and azides). Electrochemical reduction of carbonyl compounds, general aspects.

UNIT IV

Anodic oxidation of organic compounds:

Introduction, general mechanistic consideration, direct anodic oxidation, indirect anodic oxidation. Anodic oxidation of hydrocarbons, nitrogen containing compounds.

Electrosynthesis of Bioactive materials:

Introduction, simple Kolbe oxidation: application to synthesis of (+) - α onxerin and (+) - penta cyclosqualene, Kolbe cyclisation and Tandem cyclization.

UNIT V

Special topic in electro organic synthesis:

Paired electro organic synthesis, simple examples – electrogenerated reagents Homogeneous redox catalysts – General aspects of indirect electron exchanges, pure redox catalysis (general case) – use of indirect electrochemical reactions in synthesis, oxidations, reductions – Electrogenerated superoxides.

Electrochemical partial fluorination : Introduction, Anodic fluorination of aromatic compounds, olefins, carbonyl compounds, heterocyclic compounds.

Electro enzymatic synthesis : Introduction, principles of redox catalytic enzyme activation and co-factor regeneration – electroenzymatic reductions and oxidation (simple examples only).

Reference:

Organic electro chemistry by Henning Lund & Ole Hammerich, , 4th edition, Publisher: Marcel Dekker, Inc, New York.