

CHEMISTRY OF DYE SENSITIZED SOLAR CELL

(11SHPH05) (Course work for Ph.D Program)

Inorganic solar cell: Semi-conductor based solar cell- intrinsic, extrinsic and mixed type semi-conductor- assemblage of semi-conductor working of solar cells- principles involved- solar energy conversion strategies-solar cell performance as a function of light intensity –commercial solar cells- kinetic, thermodynamic and electrical characteristics of solar cells – applications of solar cells- shortcomings of commercial solar cells.

Organic solar cell: Dyes- colour and constitution- classification of dyes- natural pigments-sources- isolation of natural dyes- technology involved in segregation and purification of dyes – characteristics of dye stuffs- optical properties – light sensitivity – excitement of electron transport mechanism- electrical characteristics – drawbacks of dyes as sensitizers for solar cell applications- chlorophyll and fullerene based solar cells.

Organo-metallic solar cells: Transition metal pigments- ruthenium, iridium and osmium based organo – metallic's – photo electro chemical behavior of complexes – effects of anchoring groups, auxiliary and bridging ligands on photo electro chemical behavior- phosphonic acids as anchoring groups- dye synthesis.

Fabrication of DSSC: Dye Sensitized solar cells –principles of working of DSSC – components of DSSC- materials selection- metal oxide semi-conductor- ITO – TiO₂ coating techniques- Redox couples – counter electrodes- fabrication techniques- mechanism of working of DSSC- current- potential measurements – kinetics, thermodynamics and electro chemical aspects of DSSC – stability and potential of DSSC- applications of DSSC future day solar cell.

Instrumental methods for DSSC: Analytical aspects of DSSC- instrumentation- UV, visible and NIR spectroscopy – cyclic voltammetry – Transition spectroscopy – optical electrical and spectral studies – micrometry- AFM, SEM, TEM and EDAX – X-ray photoelectron spectroscopy(XPS).

REFERENCES

1. J.A. Kent Riegels – “Hand Book of Industrial Chemistry, 7th Edition”, Van Nostrand Reinhold Co., Newyork, 1974
2. Peterwifeman – “An Introduction to Industrial Organic Chemistry, 2nd Edition”, Applied Science Publishers Ltd., London, 1979
3. P. H. Groggins – “Unit Process in Organic Synthesis “, McGrawHill Book Co., Koga Kusha, 1984
4. “Kinetics and Thermodynamics of Dye (group-VII) Sensitized Nanocrystalline TiO₂ Photoelectrodes “, Elizebath Idonia, Mayo (2004) California Institute of Technology.