Course Title: Photochemistry

Course Code: CH-813

Credit Hours: 3-0

Prerequisite: Nil

Course Objectives

Students will study the mechanics of radiation-induced chemical changes in molecules as well as radiation dosimetry and radiation chemistry applications. They'll also learn about radioactive decay and how Mossbauer spectroscopy uses radioisotopes. Students will learn about the advanced of fluorescence, phosphorescence, and other photochemical phenomena, as well as how they can be used.

Course Outcomes

After having completed the course, the candidates will be able to conclude about the photochemistry, radiation chemistry, photophysical reactions and kinetics of photophysical reactions.

Course Contents

Principles of photochemistry, laws of photochemistry, Einstein's law of photochemical equivalence, rates of intramolecular processes, chemical reactions and quantum yields with examples, factors effecting on quantum yields, energy transfer in photochemical reaction, quantum yield of emission process radiation and nonradiation process, kinetics and quantum yields of radiative and nonradiative process (fluorescence, phosphorescence, inter-system crossing, internal conversion, quenching) and Stern-Volmer reactions, photosensitized reactions.

Development and advancement in radiation chemistry, radiation dosimetry, Fricke dosimeter, dosimetry in pulse radiolysis, energy states in radiation chemistry, excited states, fragmentation, pre-dissociation, photochemical decay, ions and electrons, radiolysis of gases, liquids, solids, frozen liquids and ions in radiation chemistry, recent application of radiation chemistry.

Photophysical reactions, combination of H_2 and Br_2 gases to form HBr, reaction between H_2 and Cl_2 gases, multiplicity, classification of fluorescence, differences between fluorescence and phosphorescence, chemiluminescence, Chemical reactions in liquid phases, photochemical effects in solids, Frank-Condon principles, kinetics of photophysical reactions.

Recommended Books

1. Spinks, J. W. T. and Woods, R. J., An introduction to Radiation Chemistry, 3rd
2. ed., Wiley Inter Si. Pub., USA, (1990).
3. Choppin, G., Liljenzin, J-O., Rydberg, J., Radiochemistry and Nuclear Chemistry,
4. 3rd ed., Butterworth-Heinemann, (2002).
5. Atkins, P. and Paula, J. D., Atkin's Physical Chemistry, 9th ed., Oxford University Press, (2010).
6. Physical Chemistry by Kundu, N and Jain, S.K.,S. Chand and Company Ltd. 1984.
7. Mostafavi, M., Douki, T., Radiation Chemistry: From Basic to Applications in
8. Material and Life Sciences, EDP Science, (2008). 5. Dunkin, I., Photochemistry,

Vol. 36, RSC Publishing, (2007).