

CH-436 Nuclear and Radiation Chemistry

Credit Hours: 3-0

Pre-requisite: Nil

Course Objectives

Students will learn about the mechanisms of radiation induced chemical changes in molecules, radiation dosimetry and applications of radiation chemistry. They will also learn about radioactive decays, and how radioisotopes are produced and applied in Mössbauer spectroscopy.

Course Contents

- a. Nuclear and Radiochemistry: An introduction to Nuclear and Radiochemistry, discovery of atom and Nucleus, nuclear properties like as nuclear bonding energy, nuclear mass, nuclear radius, nuclear coulomb Barrier and Nuclear Forces.
- b. Nuclear Chemistry: Atomic nucleus, nuclides, nuclear stability, modes of decay, nuclear energetics, nuclear models (shell + liquid drop model), fusion and fission, non-spontaneous nuclear processes, nuclear reactors, beta decay systematic, nuclear spins.
- c. Radiation Chemistry: 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. Instrumentation, purity of chemicals and methods. recent application of radiation chemistry.

Course Outcomes

4. Students will know about the mechanisms of radiation induced chemical changes in molecules, radiation dosimetry and applications of the radiation chemistry. They will have learnt about radioactive decays, and how radioisotopes are produced and applied in Mössbauer spectroscopy.

Recommended Books

1. Spinks, J. W. T. and Woods, R. J., *An introduction to Radiation Chemistry*,

- 3rd ed., Wiley Inter Si. Pub., USA, (1990).
2. Choppin, G., Liljenzin, J-O., Rydberg, J., *Radiochemistry & Nuclear Chemistry*,
 3. 3rd ed., Butterworth-Heinemann, (2002).
 4. Mostafavi, M., Douki, T., *Radiation Chemistry: From Basic to Applications in Material and Life Sciences*, EDP Science, (2008).
 5. Dunkin, I., *Photochemistry*, Vol. 36, RSC Publishing, (2007).
 5. Konya, J. and Nagy, N. M., *Nuclear and Radiochemistry*, 1st ed., Elsevier, (2012).
 - Scaglia, B., *The Fundamentals: An Understanding of Photochemistry*, Biblio Bazaar, (2011)

