



NUCLEAR AND RADIOCHEMISTRY

PROF. B.S.TOMAR

Department of Chemistry

PROF. P.K.MOHAPATRA

Department of Chemistry
Homi Bhabha National Institute

PRE-REQUISITES : B.Sc in Chemistry, with Physics and at least up to first year

INTENDED AUDIENCE : M.Sc. and Ph. D. Students

INDUSTRY SUPPORT : Several academic institutions, Industries will be interested

COURSE OUTLINE :

Nuclear chemistry deals with the study of nuclear properties of elements using chemistry as a tool. Radiochemistry deals with study of chemical properties of elements using the characteristic radiations emitted by their radioisotopes as a tool. The subject of Nuclear and Radiochemistry helps in understanding the nuclear and chemical properties of elements including actinides, which in turn helps in understanding the chemical phenomena associated with nuclear science and technology as well as expanding the scope of applications of radioisotopes in various fields, such as, chemistry, industry, healthcare, agriculture, water, environment, etc. The students will learn the fundamentals of radioactivity, nuclear decay, nuclear structure and stability, nuclear models, nuclear reactions including fission, radiochemical practices and chemistry of actinides.

ABOUT INSTRUCTOR :

Prof. B.S.Tomar superannuated in December 2017 as Director, Radiochemistry and Isotope Group, Bhabha Atomic research Centre, Mumbai. He did his M.Sc. in Chemistry from Garhwal University in 1979 and joined Radiochemistry in 1982 after graduating from 25th batch of BARC Training School. He has worked in the area of nuclear fission, heavy ion reactions, ion beam analysis and actinide speciation and has published more than 200 papers in international journals. He has taught the subject of Nuclear and Radiochemistry at postgraduate level for more than 25 years at BARC Training School. Dr. Tomar served as Dean of chemical sciences (BARC) as well as Convener, Board of Studies, Chemical Sciences, Homi Bhabha National Institute. So far 17 Ph.D. and 3 M.Sc. students have obtained their degrees under his supervision from Mumbai University and HBNI. He was a visiting Professor to Technical University, Delft, Netherlands during 2007-2008. He was invited by IAEA to serve as an expert on Radiation Detection and Measurement and as a member of the standing advisory group on safeguards implementation (SAGSI). He has received the DAE special contribution and group achievement awards for his contribution towards the programmes of the department. Post superannuation Dr. Tomar served as Raja Ramanna fellow, DAE during 2018-2021. Presently Dr. Tomar is Institute Chair Professor, Homi Bhabha National Institute, Mumbai.

Prof. P. K. Mohapatra, born in Cuttack, Odisha, did his M.Sc. (First rank) from Utkal University, Bhubaneswar in 1985. He joined Radiochemistry Division, BARC in 1987 after graduating from the 30th Batch of the BARC training school. He did his Ph.D. from University of Bombay in 1994 and did post-doctoral research at University of Mainz, Germany (1999-2000) under the Alexander von Humboldt fellowship. His research interests include separation of actinides and fission products using novel extractants, in ionic liquid based solvents and novel separation techniques including liquid membranes. Based on his contributions in the area of separation of actinide and fission products from radioactive feeds he has been given the DAE-SRC outstanding researcher award (2009) and the Homi Bhabha Science & Technology Award (2010). In view of his excellent contribution to separation science and technology, he has been elected as an honorary Fellow of National Academy of Sciences, Allahabad. A recognized guide of Mumbai University and Homi Bhabha National Institute (Deemed University), Dr. Mohapatra is an Associate Editor of Separation Science and Technology and one of the Editors of Radiochimica Acta. He is in the advisory board of several prestigious journals including Solvent Extraction and Ion Exchange. Currently, he is heading Radiochemistry Division of BARC. He has over 400 publications in peer reviewed international journals with over 7800 citations and over 500 presentations in conferences / symposia.

COURSE PLAN :

Week 1: Radioactivity and Nuclear decay

Week 2: Nuclear structure and stability

Week 3: Nuclear models

Week 4: Nuclear reactions

Week 5: Nuclear Fission and Fusion

Week 6: Radiation Detection and Measurements

Week 7: Radiochemical methods

Week 8: Nuclear Analytical Techniques

Week 9: Synthesis of actinides and trans-actinides

Week 10: Actinide Concept

Week 11: Chemistry of Actinides

Week 12: Actinide environmental chemistry