

Radiochemistry Fundamentals

Nuclear Periodic Table

The Nuclear Periodic Table is a color-coded version of the standard periodic table. It categorizes elements based on their nuclear properties and typical products. Categories include: Fusion Products (pink), Heavy Activation Products (green), Light Activation Products (yellow), Fission Products (blue), Cosmogenic Products (purple), and Natural Products (orange). The table also includes atomic numbers and element symbols for all known elements.

This 5-day course is designed for engineering and science employees who need a basic understanding of fundamental nuclear and radiochemistry processes, and their applications in radioactive waste management, the nuclear fuel cycle, nuclear medicine, chemical engineering, and analytical chemistry.

A COURSE VARIED FOR ALL BACKGROUNDS ...

- Gain a solid background in the fundamentals and theory of nuclear and radiochemistry.
- Learn the basics of counting statistics for radiochemistry.
- Understand the basics of instrumentation for radiochemistry counting: gamma-ray spectroscopy, alpha spectroscopy, liquid scintillation, etc.
- Understand the principles of radiochemistry in the recycling of spent nuclear fuel.

Course Topics

Atomic structure

- Atomic electron orbital arrangements
- Organization of the periodic table
- Groups and trends on the periodic table

Nuclear structure and stability

- Decay modes and types of radiation
- The chart of the nuclides

Radioactive transformation

- Equilibria
- Secular equilibrium
- Transient equilibrium
- No equilibrium

Decay Modes

- Alpha decay
- Beta decay
- Gamma transitions
- Branching decay
- Spontaneous fissions
- Rare decay modes

Measurement of nuclear radiation

- Gas-filled detectors
- Scintillation detectors
- Semiconductors
- Alpha spectrometry
- Beta spectrometry
- Gamma ray spectrometry
- Gamma ray low-level counting
- Statistics and errors in counting

Nuclear reactions

- Transmutation and the production of synthetic radioelements
- Cross-sections of nuclear reactions
- Nuclear fission
- Activation analysis

Nuclear fuel cycle

- Nuclear reactor radiochemistry
- Reprocessing of nuclear fuels
- Radioactive waste management

Dating by nuclear methods

- Cosmogenic Radionuclides
- Natural decay series
- Ratio of stable isotopes
- Radioactive disequilibria

General chemistry applied to radiochemistry

- Actinide chemistry
- Mass balances
- Chemical equations and stoichiometry
- Equilibrium reactions
- Acid/base reactions
- Oxidation/reduction reactions
- Aqueous solubility
- Phase partitioning

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THE AMERICAN ACADEMY OF HEALTH PHYSICS (AAHP) HAS AWARDED THIS COURSE 32 CONTINUING EDUCATION CREDITS.
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