

Nuclear and radioanalysis; its applications

Schedule:

Types of radioactive decay. Radiation and its interaction with matter, kinetics of interaction. Kinetics and types of nuclear reactions. Measurement of radiation.

Radioanalysis using natural radioisotopes. Determination of geological ages using isotopes from radioactive decay series, based on nuclear reactions, K-40-Ar-40 and Rb-87-Sr-87 parent-daughter pairs. Determination of geological and historical ages using C-14 and H-3 isotopes.

Isotope effects. Analytical information obtaining from the ratio of stable isotopes (hydrogen, oxygen, nitrogen, carbon, sulfur).

Principles of radioactive indication. Rules for the selection of radioactive tracers, concept(s) of purity.

Classification of tracer studies by thermodynamic and practical considerations. Supplementing classical chemical methods with radioactive methods.

Radioactive tracers in living organisms: in vitro and in vivo methods. Nuclear medicine.

Radioactive indicators in industry.

Analytical methods based on the interaction of radiation and matter, classification based on the irradiating and escaping particles.

Production of neutrons and their analytical applications. Nuclear reactions with neutrons. Neutron activation and prompt gamma activation analysis. Imaging with neutrons. Neutron scattering and diffraction.

Analysis with photons: X-ray fluorescence analysis. Mössbauer spectroscopy.

Electron microscopes and microprobes.

Use of positively charged particles: Particle-induced X-ray emission and gamma analysis.