N10 Processing, Storage and Disposal of Nuclear Wastes

Summary

This module reviews the basic approaches of nuclear waste management and gives an introduction to the scientific fundamentals of nuclear waste processing and disposal. A range of topics will be discussed including classification schemes, description of basic techniques of nuclear waste processing, methods of storage, and disposal of different types of nuclear wastes.

On completion, students should have obtained:

- A sound understanding of radioactivity, radionuclides and the different types of radioactive waste.
- An appreciation of the general approaches to nuclear waste management.
- A grounding in the techniques of nuclear waste processing to give wasteforms suitable for storage and ultimate disposal.
- Knowledge of the encapsulation and immobilisation of waste in a range of wasteforms.
- Understanding of general waste disposal concepts.

Syllabus

- Introduction to radioactive waste, waste encapsulation and immobilisation, and the multi-barrier concept for radioactive waste disposal.
- Radioactive decay and the interactions between radiation and matter
- Sources of radioactive waste, waste classification and characterisation
- Basic approaches and principles of radioactive waste management
- Nuclear waste regulation, legal framework, and responsible bodies
- Uranium occurrence, exploitation and mining
- Uranium mining waste geochemistry and environmental impacts
- Pre-treatment of radioactive wastes
- Wastes from reprocessing and decommissioning
- Application of cements and cementation technologies for waste immobilisation
- Application of glasses and vitrification technology for waste immobilisation
- Application of ceramics and ceramification techniques for waste immobilisation
- Introduction to nuclear waste disposal
- Geological repositories for radioactive waste isolation
- Deep borehole disposal concepts