Nuclear Safeguards and non-Proliferation

Environmental Sampling Analysis

A key topic in international Safeguards is the work in preventing further spread of nuclear weapon technology and nuclear materials that can be used for the production of nuclear weapons. A main tool for detecting undeclared nuclear activities is environmental sample analysis. The techniques used today have proven to be extremely sensitive and effective for international safeguards measures.

Environmental Sampling for Safeguards Purposes

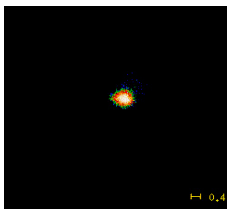
Inspectors are provided with sample kits.

Sampling of dust at a nuclear facility

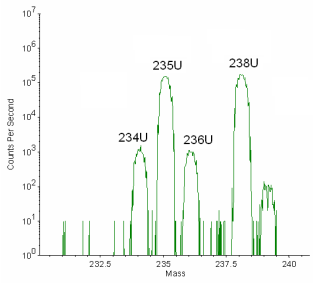
Cotton swipe sample with the collected dust particles

Isotopic Sample Analysis by Secondary Ion Mass Spectrometry (SIMS)

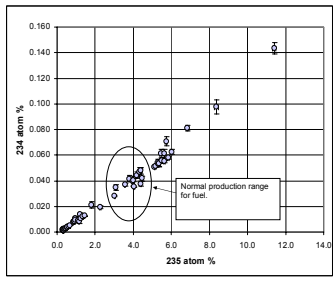
Measurements at ITU using a Cameca 4F-6F SIMS



^{238}U ion image of an area of 100x100 µm with a U particle.

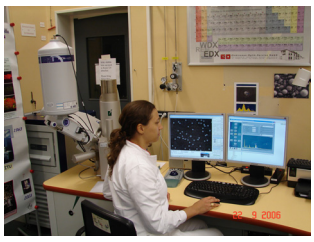


The example shows data of high enriched uranium.

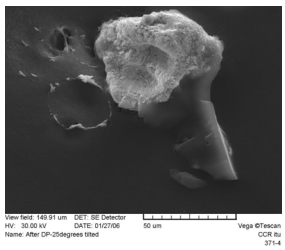


Graph of the ^{234}U versus ^{235}U relationship

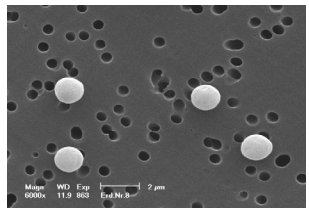
Elemental analysis with EDX and morphology studies by Scanning Electron Microscopy (SEM)



ITU operates a Tescan VEGA 30kV **SEM** for the analysis of individual particles. The elemental composition can be measured either using Energy Dispersive or Wavelength Dispersive **X-ray Microanalysis** (WDX/EDX)



Picture showing the **morphology of a particle** from the Thule accident in 1968



The SEM is also used for other purposes like control measurements of the 1 µm mono dispersed **reference particles produced at ITU.** (This material is later used for instrument calibration in isotopic particle measurements)

Contact

Magnus Hedberg
European Commission • Joint Research Centre
Institute for Transuranium Elements
Tel. +49 7247 951 578 • Fax +49 7247 951 99 578
E-mail: Magnus.Hedberg@ec.europa.eu

JRC EUROPEAN COMMISSION

Institute for Transuranium Elements