

Investigation of radioactive materials

Scientific services for industrial research and development activities

The PSI Hot Laboratory

Radioactive substances are produced or used extensively by industry, for example in medicine, the food industry or energy production. As a consequence of this use, radioactive materials and radioactive waste are produced and must often be analyzed or characterized.

The PSI Hot Laboratory is the single Swiss infrastructure allowing the safe and secure handling and examination of highly toxic radioactive substances and components.

Analysis of radioactive materials

With his highly skilled staff and extensive analytical capabilities, the PSI HOTLAB division can perform efficient and high quality scientific service assignments for the post irradiation examination of nuclear materials.

PSI offers the following capabilities:

- Non-destructive post-irradiation examination of full-size nuclear fuel rods.
- Preparation of small segments of fuel rods for destructive examination.
- Detailed analytical investigation of nuclear fuel.
- Analytical examination of irradiated or contaminated components or materials.
- Handling, characterization and conditioning of highly radioactive materials.

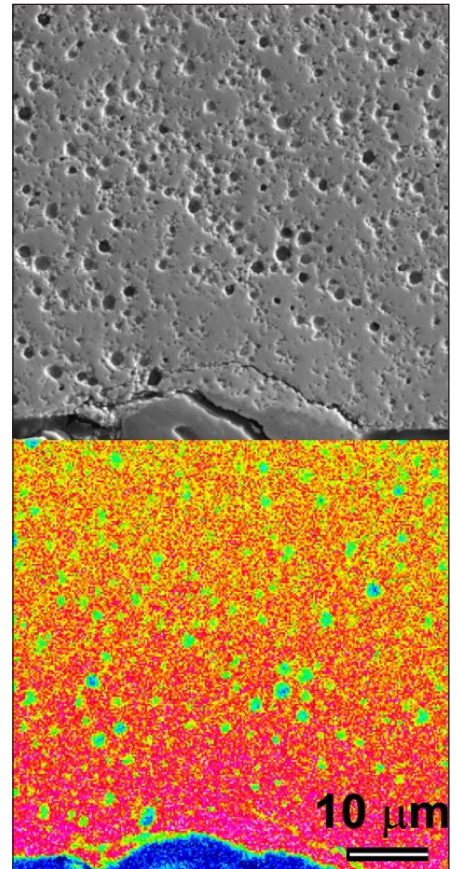


Figure 2: EPMA analysis of a fuel specimen.

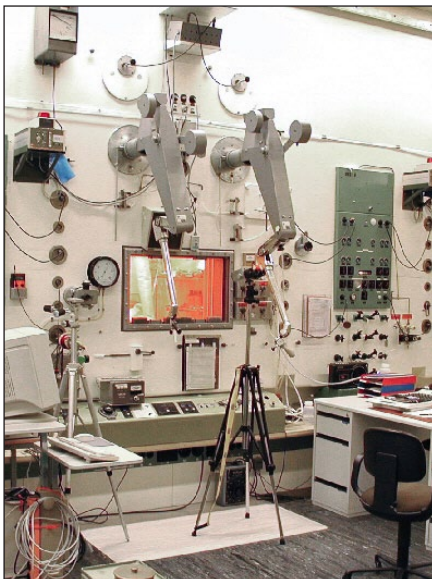


Figure 1: The PSI Hot Laboratory is the largest Swiss facility of its kind.



Figure 3: Hot Laboratory hot cells.

Analytical tools for the investigation of radioactive materials

Analysis of radioactive materials requires the use of shielded instruments or/and the capability to prepare very small, but representative, specimens.

The PSI Hot Laboratory offers a range of sophisticated instruments developed specifically for such purposes:

- Large Hot Cells and a dedicated infrastructure for the handling, examination, cutting and conditioning of large radioactive components
- Hot extraction cells for the quantitative determination of Hydrogen content in radioactive materials
- Density measurements of nuclear fuel
- A fully shielded optical microscope
- A fully shielded Electronic Microprobe (EPMA)
- A scanning electron microscope for light radioactive materials
- A fully shielded Secondary Ion Mass Spectrometer (SIMS)
- Modified Inductively Coupled Plasma Mass Spectrometers (ICPMS) for the analysis of radioactive materials
- A shielded laser-ablation cell for ICP-MS analysis
- Investigation of the mechanical properties of radioactive materials

In addition, the Hot Laboratory can provide, in collaboration with other PSI groups, unique analysis capabilities such as:

- Neutron radiography analysis of highly radioactive materials
- Neutron spectroscopy examination of radioactive materials
- X-Ray diffraction and fluorescence analysis of radioactive materials



Figure 4: **Shielded EPMA**

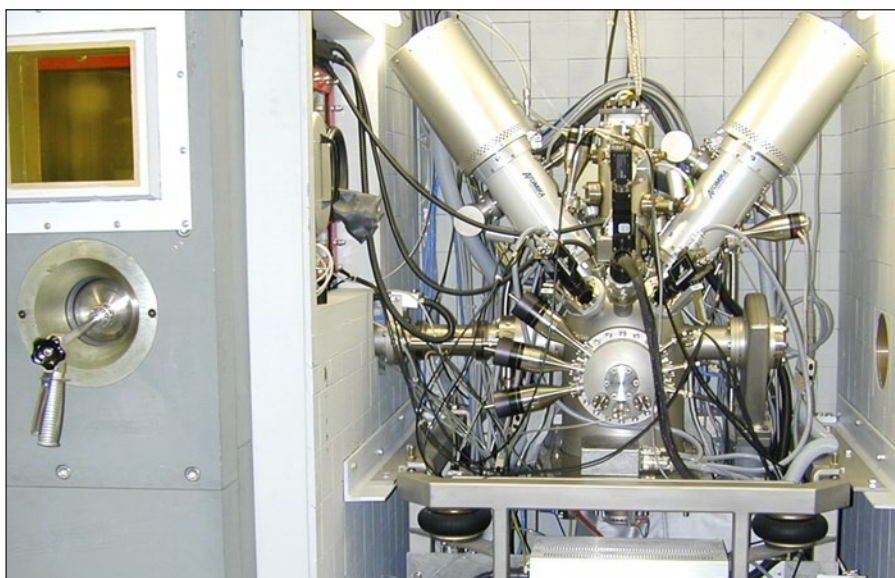


Figure 5: **Shielded SIMS**

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