

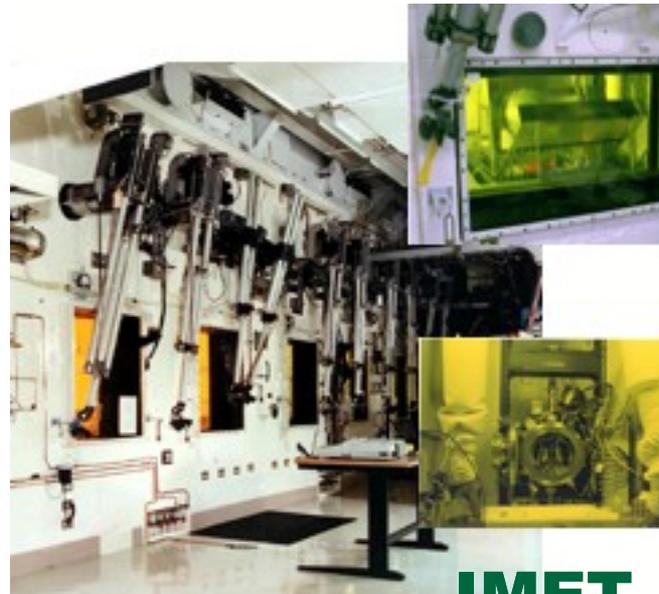
ORNL maintains a unique and world class suite of facilities for irradiated materials science.

- **Irradiated Fuels Examination Laboratory (IFEL)** is a comprehensive facility for PIE of nuclear fuels.
- **Irradiated Materials Examination and Testing Laboratory (IMET)** contains a comprehensive suite of equipment for all classes of non-fuels materials.
- **Low Activation Materials Design and Analysis Laboratory (LAMDA)** allows for examination of low-activation materials without the need for remote manipulation.

Combined, IFEL, IMET, and LAMDA represent one of the most extensive capabilities for the examination of radioactive materials in the world. Research encompasses basic science, applied engineering, and regulatory work, spanning materials for all past, present, and future reactor applications.



IFEL



IMET



LAMDA



All testing is governed by a Quality Assurance program tailored to each sponsor's individual requirements (i.e. NQA-1 or NRC 10CFR50-B), ensuring the highest quality data which is vital for nuclear programs.

IFEL Features



Full Length LWR Fuel Rods Are Received Using the NAC-LWT Cask

Advanced Diagnostics and Evaluation Platform (ADEPT)

- Video Inspection
- Advanced Thermal Imaging
- 1-Dimensional Gamma Scan
- Metrology (Length & Diameter)
- Eddy Current Inspection
- Surface Temperature
- Fuel Rod Pressure
- Fuel Rod Plenum Volume
- Fission Gas Sampling
- Precision Rod Segmenting



PIE of Full Length LWR Fuel Rods Performed with ADEPT

IFEL PIE Capabilities

- Metrology & Immersion Density
- Gamma-Ray Spectrometry
- 2-Dimensional Gamma Scanning
- Capsule Disassembly
- Metallography/Ceramography
- JEOL Low Vacuum SEM
- JEOL SEM/Microprobe
- Clad Mechanical Property Testing
- High Temperature Fuels Testing



IFEL Programmatic Missions

GNEP CETE Head End Processing
 FMDP MOX Fuel Rod PIE
 Naval Reactors PIE and Testing
 NRC LOCA Integral Testing
 NGNP/AGR PIE and Testing
 Y-12 Repackaging Activities
 AREVA PIE and Testing

The IMET and LAMDA facilities provide complimentary capabilities for high and low-dose samples. This unique set of capabilities allows “right-sized” PIE and providing the most cost and time efficient analysis for irradiated structural materials. Access to other ORNL user facilities, such as SHaRE, provides complete micro-analytical capabilities.

IMET Features

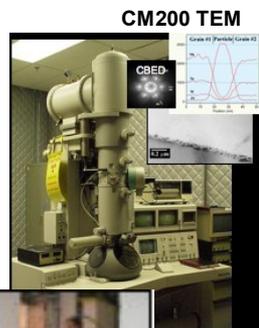
IMET has six cells equipped to handle bottom-loading casks. IMET also has a specimen preparation laboratory, a high bay work area with an over head crane, and specimen storage wells.



Testing with Instron tensile machine

IMET PIE Equipment

- Laser Profilometer
- Precision densitometer
- Video Equipment
- Instron tensile machine with high temperature vacuum chamber
- Automated ball indentation system
- Automated microhardness indenter
- Instrumented Charpy impact system
- Computer-controlled fracture toughness and fatigue systems
- Annealing furnace
- Philips XL30 SEM
- CNC milling machine



XL30 SEM

IMET Programmatic Missions

GNEP Advanced Materials
 ITER PIE and Testing
 Naval Reactors PIE and Testing
 NRC RPV Testing and Analysis
 NGNP/GenIV PIE and Testing
 Prometheus PIE and Testing
 HAPL PIE and Testing
 BES Fusion PIE and Testing
 International Collaborations

LAMDA Features

The LAMDA laboratories are equipped for analysis of irradiated samples at < 60 mR/hr at 30 cm. This mode of operation allows for more precise and delicate samples than possible in traditional hot cells. LAMDA is also an ideal setting for collaborative work.



MTS tensile/fracture toughness machine

LAMDA PIE Equipment

- Laser Profilometer
- Two precision densitometer systems
- UTS tensile machine with high temperature vacuum chamber
- Two computer-controlled fracture toughness and fatigue systems
- Five computer-controlled tensile systems
- Automated microhardness indenter
- Two electrical conductivity systems
- Three thermal diffusivity units
- Precision dilatometer
- Hitachi SEM
- Cutting, grinding, and specimen preparation systems
- Complete suite of TEM specimen preparation equipment



Enter thermal diffusivity unit and density gradient column

LAMDA Programmatic Missions

GNEP Advanced Materials
 ITER PIE and Testing
 Naval Reactors PIE and Testing
 NGNP/GenIV PIE and Testing
 Prometheus PIE and Testing
 AREVA PIE and Testing
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