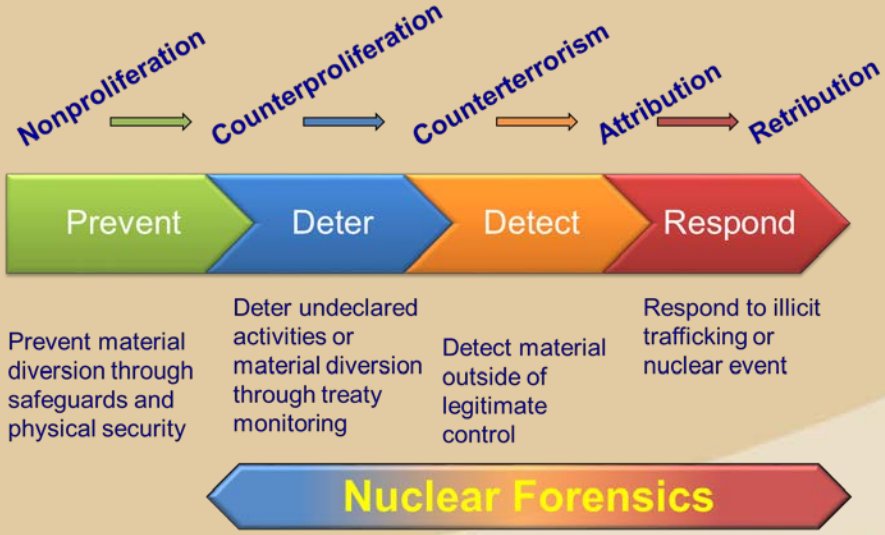
Technical Nuclear Forensics Capabilities and Training Applications

Los Alamos NATIONAL LABORATORY EST. 1943

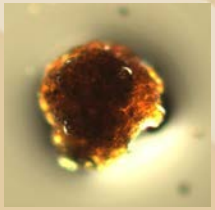
Description/Capabilities

- LANL technical capabilities support the forensic evaluation of nuclear events in both the pre-detonation and post-detonation phases including material analysis and device characterization.
- We leverage 70 years of knowledge, expertise, infrastructure, and unique laboratory facilities that support LANL weapons, safeguards, and treaty monitoring missions.
- LANL has demonstrated abilities to characterize nuclear and radioactive material for elemental, isotopic, chemical, and physical signatures, and interpret this data in the context of nuclear forensics investigations.
- As a US designated operational nuclear forensics laboratory LANL maintains and provides laboratory analysis response capability for interagency partners, including the FBI, DOE-IN, DHS, NNSA, and other customers.
- Capability to provide hands-on training for characterization of materials out of regulatory control with uranium, plutonium, and other radioactive items using gamma-ray spectroscopy methods.

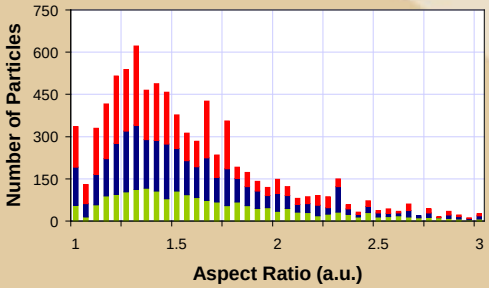
Nuclear Security Spectrum and Nuclear Forensics



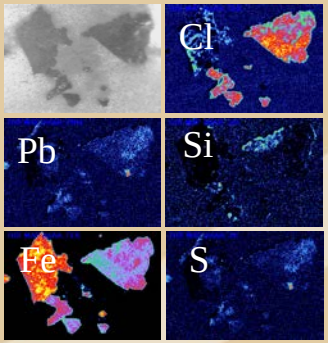
Science of Signatures

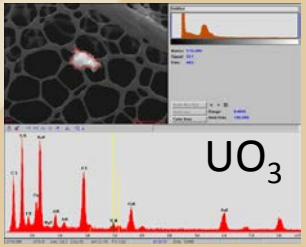


Origin?
Production Method?
Age of Material?
Intended Use?
History



Nuclide	Sample (μg/g)
^{234}U	5.5×10^{1}
^{235}U	5.7×10^{3}
^{238}U	7.9×10^{5}
^{238}Pu	7.4×10^{-4}
^{239}Pu	2.5×10^{1}
^{240}Pu	1.0×10^{-2}
^{242}Pu	2.5×10^{-4}





Chemical and material science coupled with fuel cycle expertise facilitate a better understanding of how material characteristics are used for nuclear forensics applications.

Technical Nuclear Forensics Capabilities and Training Applications

Nuclear Security and Nuclear Material Out of Regulatory Control

- **Nuclear Forensics:** The collection and analysis of nuclear or radiological material to support investigations into the diversion, trafficking, or illicit activities involving those materials. The primary goal of nuclear forensics examinations is to link materials to people, processes, events, or locations.
- **Nuclear Forensics R&D:** Research efforts at LANL focus on identifying how forensic characteristics are created, changed, and disappear during fuel cycle operations, and the interpretation of these signatures to assist in nuclear forensics investigations.
- **National Nuclear Forensics Library:** LANL provides data and subject matter expertise to support the US National Nuclear Forensics Library which helps ensure the ability to identify nuclear and other radioactive materials found outside of regulatory control.

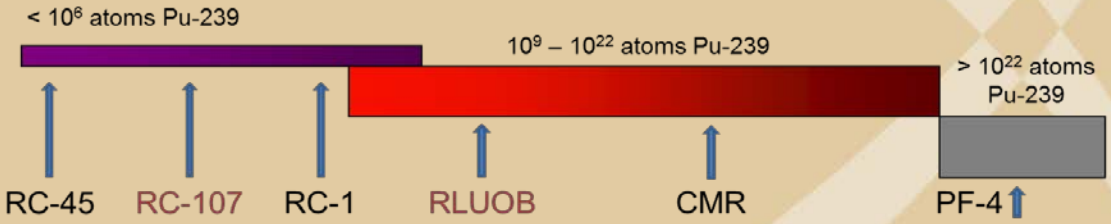
International Nuclear Forensics Engagements

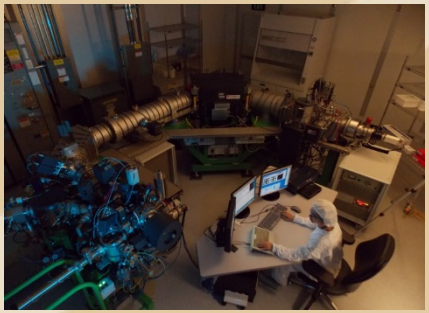
- LANL scientists work collaboratively with international peers to further the science of nuclear forensics and universal understanding of the forensic signatures of nuclear materials.
- LANL experts work bilaterally and through the IAEA to help build international nuclear forensics capacity through training and workshops that assist countries with developing and improving nuclear forensics programs.
- Development of hands-on training modules for gamma-ray spectroscopy for characterization of Nuclear Material Out of Regulatory Control and capability to provide training with uranium and plutonium items at the TA-66 Training and Research Facility.

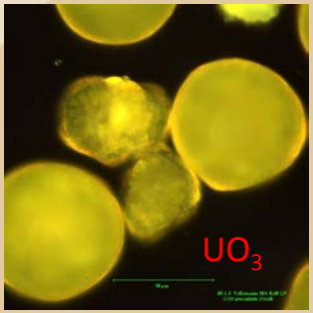
These efforts are funded through the Office of Nuclear Smuggling Detection and Deterrence.

Facilities

LANL's facilities house equipment and instrumentation necessary to forensically characterize nearly any type of nuclear or radioactive sample ranging from kilograms to femtograms. This unique suite of facilities supports a wide variety of operational, R&D, and training missions for the US and international nuclear forensics communities.







Analysis and characterization of actinides is a key component of LANL's nuclear forensics capability.

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