# What is nuclear forensics?

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Nuclear forensics is the investigation of nuclear materials to find evidence for example the source, the trafficking, and the enrichment of the material. The material can be recovered from various sources including dust from the vicinity of a nuclear facility, or from the radioactive debris following a nuclear explosion.

Results of nuclear forensic testing are used by different organizations to make decisions. The information is typically combined with other sources of information such as law enforcement and intelligence information.

The first seizures of nuclear or otherwise radioactive material were reported in Switzerland and Italy in 1991. Later, reports of incidents of nuclear material occurred in Germany, the Czech Republic, Hungary and other central European countries. Nuclear Forensics became a new branch of scientific research with the intent of not only determining the nature of the material, but also the intended use of the seized material as well as its origin and about the potential trafficking routes. Nuclear forensics relies on making these determinations through measurable parameters including, but not limited to chemical impurities, isotopic composition, microscopic appearance, and microstructure. By measuring these parameters, conclusions can be drawn as to the origin of the material. Identification of these parameters is an ongoing area of research; however, data interpretation also relies on the availability of reference information and on knowledge of the fuel cell operations.

The lesson will include the Analysis, Counting Techniques, Mass Spectrometry and Additional Nuclear Forensic Methods.

The IAEA definition

Nuclear forensics is the analysis of intercepted illicit nuclear or radioactive material and any associated material to provide evidence for nuclear attribution. The goal of nuclear analysis is to identify forensic indicators in interdicted nuclear and radiological samples or the surrounding environment, e.g. the container or transport vehicle. These indicators arise from known relationships between material characteristics and process history. Thus, nuclear forensic analysis includes the characterization of the material and correlation with its production history.

Examples to Nuclear Forensic events.

Analysis of swipe samples – bulk analysis is shown in figure 1.



Fig 1: swipe samples Analysis.

Analysis of single particles by LA-ICP-MS technique is a knowen tecniqe for nuclear forensic, see figure 2.
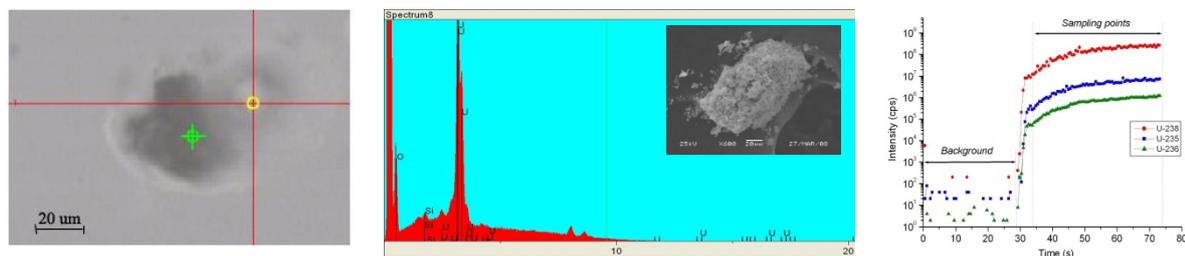


Fig 2: Analysis of single particles by LA-ICP-MS technique

"NUCLEAR FORENSICS SUPPORT REFERENCE MANUAL" [1] is a basic tool for nuclear forensics research and studies.
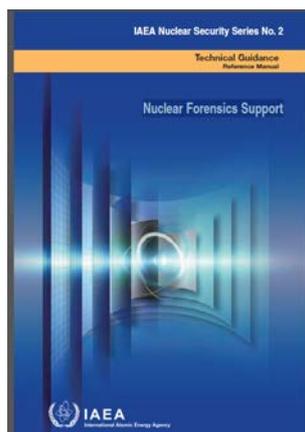


Fig 3: NUCLEAR FORENSICS SUPPORT REFERENCE MANUAL - IAEA

**References**

[1] NUCLEAR FORENSICS SUPPORT REFERENCE MANUAL, IAEA Nuclear Security Series No. 2, IAEA