

Investigating The Role of Swipe Samples in Strengthening Nuclear Forensics and Sustaining Nuclear Security

Nuclear forensics is an effective technical tool for investigating nuclear materials, its properties, and its history. The importance of nuclear forensics has emerged as a result of the spread and growing phenomenon of terrorism. To get rid of this phenomenon, the international community supports any effort to strengthen and maintain a robust nuclear security system. The application of environmental monitoring as a recently developed tool to identify processes related to the nuclear fuel cycle has been suggested by international safeguards.

The work describes the robust nuclear security system in the point of view of implementing a national framework for nuclear forensic capability and technical tools and instruments required for nuclear forensics. Techniques such as gamma spectrometry, radiochemical separation, inductively coupled plasma using optical emission spectrometer or mass spectrometer are powerful for revealing information related to nuclear materials in any form. Nuclear materials can be in a form of traces such type of samples to be characterized a swipe sample should be taken and introduced to one of the above techniques.

The paper focuses on assaying five environmental samples from nuclear facilities to test whether it contains nuclear material or not. The Scanning Electron Microscope (SEM) and Energy Dispersive X-ray (EDX) tools are used to localize particles, counting the targeted particles and x-ray is used to know the concentration of each element. The SEM used in this study was a JEOL JSM-6510LV-Japan with a resolution of 1pA0 to 1μA0. The five environmental samples were measured at different conditions of magnifications and working voltages. Two types of EDX analysis are used the area analysis and the spot analysis. The spot size is adjusted at the optimum value (50) also the working distance (9:11).

Finally, nuclear forensics has a vital role within a national nuclear security infrastructure. National policy-makers, competent authorities, law enforcement, and technical personnel should be aware of this role. Environmental samples analysis need more sophisticated techniques like ICP-MS, alpha spectrometer to reveal its secrets beside SEM coupled with EDX. SEM and EDX are robust techniques to localize microparticles, counting the number of uranium or thorium particles and determining the concentration of each particle within the sample. The use of spot analysis in SEM images gives fast and accurate results about the nuclear materials within samples.

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