RAPID ISOTOPE ANALYSIS OF SWIPE SAMPLES

Task

International organizations carry out routine inspections to check and monitor nuclear facilities. As part of a frequently used process, swipe samples are taken in the facilities in order to analyze the collected particles in the laboratory. Minute quantities of material in these samples can provide inspectors with important clues to the processes being used. A rapid testing process for pre-screening of the collected sample material is required to analyze the test samples efficiently.

Method

As part of a study for the German Support Program for the International Atomic Energy Agency IAEA, Fraunhofer ILT is developing a measurement process for an isotope-sensitive test of low quantities of material on swipe samples. The process uses scanning microanalysis with laser-induced breakdown spectroscopy. A laser beam is guided over the swipe sample and provides spatially resolved analysis of the material contained in the sample. The induced emissions are analyzed spectroscopically at high resolution, thus providing sensitive detection coupled with isotope separation of minute traces of uranium.

Result

The developed process enables the material distribution on a swipe sample to be analyzed rapidly without any prior preparation. Traces of a few micrograms per square centimeter are sufficient to determine the level of enrichment of uranium particles.

Applications

The speed of the laser process allows subsequent further analysis methods to be used more efficiently, so inspectors can respond faster to any anomalies found. The process has been designed to rule out cross-contamination between individual samples, with minimal work involved in handling the samples. It also allows for a flexible response to the varying quality of the test samples.

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3 Obtaining a swipe sample in an industrial plant (Source: IAEA).