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Detection of Reprocessing Activities Using Environmental Sampling

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Being able to detect and identify undeclared reprocessing activities involving the extraction of plutonium from irradiated fuel remains a major nuclear non-proliferation concern and challenge to international Safeguards. One tool the International Atomic Energy Agency uses for detecting possible undeclared reprocessing activities is environmental sampling (ES).

The reprocessing of irradiated nuclear fuel enables the separation and extraction of uranium and plutonium for further use. In the conventional power generation fuel cycle, the recovered uranium can be converted, re-enriched or re-fabricated into new fuel. However, plutonium can also be extracted from irradiated fuel for weapons purposes, particularly if the burnup of fuel in the reactor is optimized to ensure that the maximum yield of plutonium-239 is achieved without significant degradation by plutonium-240. Recovery of plutonium from irradiated fuel is one approach to obtaining fissile material for a weapon other than the alternative, uranium enrichment.

Typically, ES involves taking swipe samples from the facilities of a known or suspected nuclear site in order to detect trace materials associated with nuclear-related activities, in the case of reprocessing a chemical operation that separates plutonium and uranium from irradiated spent fuel. This paper discusses and provides examples of the nuclear signatures detectable through ES that can be used to identify the reprocessing activities beyond just the detection of plutonium. It will also examine the potential signatures that could be used to distinguish between aqueous and non-aqueous reprocessing methods.

Country or International Organization

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