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the Noble Gas Concept of Operations for Radionuclide Sampling Concepts

Soil gas sampling methods are a critical, yet underdeveloped, component of subsurface noble gas detection during an On-Site Inspection (OSI). The verification system for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) is intended to detect any nuclear explosion, above or below ground. When a suspected nuclear explosion is detected, an OSI can be called at the site where the nuclear explosion is thought to have occurred. Subsurface environmental measurements of noble gases are allowed during an OSI for the intent of measuring noble gas fissions gases (e.g., 37Ar and 133Xe, 131mXe) that were released from a nuclear test. Noble gases can either quickly vent to the atmosphere or they can migrate to the surface through fissures and fractures in the surrounding geology. When noble gases migrate through the geology, they can be collected at the subsurface then measured by a radioxenon processing and measurement system. The challenge in an OSI is to obtain quality soil gas samples. This paper will discuss recent advances in subsurface soil gas sampling methods specific to the challenging requirements for an OSI.

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