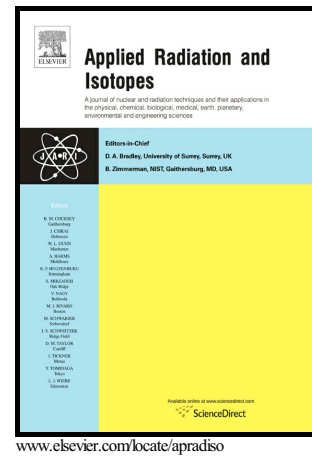


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Performance evaluation of PRIDE UNDA system with pyroprocessing feed material

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Abstract

The PRIDE (PyRoprocessing Integrated inactive DEmonstration) is an engineering-scale pyroprocessing test-bed facility that utilizes depleted uranium (DU) instead of spent fuel as a process material. As part of the ongoing effort to enhance pyroprocessing safeguardability, UNDA (Unified Non-Destructive Assay), a system integrating three different non-destructive assay techniques, namely, neutron, gamma-ray, and mass measurement, for nuclear material accountancy (NMA) was developed. In the present study, UNDA's NMA capability was evaluated by measurement of the weight, ^{238}U mass, and U enrichment of oxide-reduction-process feed material (i.e., porous pellets). In the ^{238}U mass determination, the total neutron counts for porous pellets of six different weights were measured. The U enrichment of the porous pellets, meanwhile, was determined according to the gamma spectrums acquired using UNDA's NaI-based enrichment measurement system. The results demonstrated that the UNDA system, after appropriate corrections, could be used in PRIDE NMA applications with reasonable uncertainty. It is expected that in the near future, the UNDA system will be tested with next-step materials such as the products of the oxide-reduction and electro-refining processes.

Keywords: Nondestructive assay, Nuclear safeguards, Nuclear-material accountancy, Pyroprocessing

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