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232Th Mass Determination in a Uranium/Thorium Mixture for Safeguards Purposes

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In nuclear safeguards it is required that thorium content in safeguarded material should be quantified and reported as appropriate. As such the South African State System of Control and Accounting (SSAC) on discovering a number of safeguarded waste drums which contained considerable quantities of thorium decided to initiate a project to properly quantify their thorium content using a high purity germanium detector and In-Situ Object Counting System (ISOCS) efficiency calibration software.

These metal waste drums are contained inside overpacks which for health reasons cannot be opened and thus giving rise to the challenge of determining the exact fill heights and the density of the material. Fill heights determined using transmission sources and the material density calculated from them together with the geometry used for the overpacks could be used to further refine the ISOCS calibration geometry and thus improving the quantitative result. In order to have confidence on the ISOCS measurements, it was decided to also validate the ISOCS results through the preparation of similar density standards that would be used for the efficiency calibration in the determination of the ^{232}Th activity in the material.

In addition, MGAU v4.2, which was used to determine uranium enrichment in a measured material, also provides an approximate ^{232}Th abundance relative to uranium content. ISOCS measurements of ^{232}Th masses in waste drums were compared to MGAU results. Results of these studies are presented in this paper.

Country or International Organization

South Africa

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