



Contribution ID: 23

Type: Oral Presentation

Assessing the impact of phosphate rock storage on uranium and thorium concentration in soil samples from Richards Bay using Neutron Activation Analysis.

Wednesday, 5 July 2017 14:00 (20 minutes)

Uranium-238 (U-238) and thorium-232 (Th-232) are the parent primordial nuclides who along with their progenies are sources of radiation exposure to which humans are exposed directly or indirectly. U-238 decay to Pb-206 after 14 different alpha or beta decays, while Th-232 decay series terminate at Pb-208 after 10 successive alpha or beta decays. In this study, gross alpha and beta activity concentration of sixty (60) soil samples collected from 30 sampling sites around a phosphate rock storage facility at Richards Bay were first performed using a gas flow proportionality counter to estimate the total activity of each sample without regards to specific nuclides. The samples were further analyzed for U-238 and Th-232 concentration using neutron activation analysis (NAA). The samples were irradiated by thermal neutrons with a neutron flux of about $7 \times 10^{11} \text{ ncm}^{-2}\text{s}$ in NECSA's nuclear research reactor (SAFARI 1). The maximum and minimum gross alpha activity for the soil samples analyzed were obtained to be 5692 Bq.kg⁻¹ and 34 Bq.kg⁻¹ respectively with a mean of 597 Bq.kg⁻¹. Similarly, 4072 Bq.kg⁻¹ and 24 Bq.kg⁻¹ were obtained to be the maximum and minimum values of gross beta activity concentrations respectively with a mean of 518 Bq.kg⁻¹. A correlation coefficient of 0.658 indicating a strong correlation among U-238 and Th-232 concentration was established. Furthermore, specific activities of U-238 and Th-232 in a reference phosphate rock samples were analyzed and obtained to be 118 Bq.kg⁻¹ and 783 Bq.kg⁻¹ respectively. These activity concentrations of these primordial radionuclides (238U and 232Th) in the analysed samples were found to be below the limits set out by International Council on Radiation Protection (ICRP).

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

PhD

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

Yes

Primary author: Mr MASOK, FEILIX (University of Johannesburg)

Co-authors: Dr MAVUNDA, Dazmen (Necsa/UJ); Prof. WINKLER, Hartmut (Dept. Physics, University of Johannesburg); Dr MASITENG, Paulus (University of Johannesburg); Dr MALEKA, Peane (iThemba LABS)

Presenter: Mr MASOK, FELIX (University of Johannesburg)

Session Classification: Nuclear, Particle and Radiation Physics 1

Track Classification: Track B - Nuclear, Particle and Radiation Physics