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Comparative assessment of the concentration of radioactive materials in natural sources relevant to mining activities in the Niger Republic using two measurement techniques

Naturally Occurring Radioactive Materials (NORMs) have always been present in a variety of concentrations in every part of the earth's mantle and in the tissue of every living being. Natural radioactivity can be found almost everywhere; in soil, public water supplies, soil and atmosphere. NORMs give rise to a measurable exposure to human beings. In the present study, soil samples and water sample were collected from two different sites in Niger Republic COMINAK and SOMAIR. The soil samples have been analysed using high resolution gamma-ray spectrometry and Neutron Activation Analysis. Water samples were analysed using high-resolution gamma-ray spectrometry only. From the measured gamma-ray spectra, the activity concentrations were determined for two series (^{238}U and ^{232}Th) and one non-series (^{40}K) radio nuclides. The activity concentrations of ^{238}U and ^{232}Th were determined from the average concentration of nuclides [^{214}Pb (295.2keV; 19.20%), ^{214}Pb (351.9keV; 37.10%), ^{214}Bi (609.3keV; 46.90%), ^{214}Bi (1120.2keV; 15.04%) and ^{214}Bi (1764.49 keV; 15.90%)] and [^{212}Pb (238.6keV; 43.6%), ^{212}Pb (300.09 keV; 3.18%), and ^{228}Ac (911.2keV; 25.8%), ^{228}Ac (968.9keV; 15.8%), ^{228}Ac (338.32 keV; 11.27%)] respectively. The activity concentrations of ^{40}K were determined directly by measurement of the gamma-ray transitions at 1460.8keV (100%). The obtained results confirm that one of the samples (soil COMINAK) is more radioactive than the soil SOMAIR samples and the results are going closer for the two techniques NMGS and TNAA except the thorium in the soil sample for SOMAIR.

Keywords: NORM, Gamma-ray spectrometry, Neutron Activation, Uranium mining

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