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Radioactivity Concentration and Radiological Effect of Soil from Umuahia Abia State, Nigeria

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Introduction

Mining activity plays an important hole in the Niger economy. Among a broad variety of minerals are coal, clay, uranium, petroleum and salt. It's a well know fact that the mining of these kind of commodity may lead to NORM, and its spreading in the environment.

The radioactivity has become a key problem that bothers humanity over the years, this is because of it connection man's free from physical disease and pain (Ahmadu et al., 2019). The natural radionuclides emanates from the atmosphere, this is because of the sources such as: external radiation, crusts of earth, e.g. mineral rock ores and soil; also those coming from human bodies as a result of the radionuclides in the air human takes in, drinking water and food consumed etc. (Ibrahim et at., 2021). The most elevated origin of radiation natural exposure emanates from the primordial radionuclides such as ^{238}U and ^{232}Th. The examination of the approximate concentration of radionuclide distribution in the man's immediate surrounding is vital in making available radiological data (Eyebanjo et al., 2018). As the soil is regarded as the major contributor to the radiation emanating from the background radiation, the awareness of its radioactivity global composition is completely significant (Ibrahim et at., 2021).

The study area is located at Umuahia south, Nigeria with geographic coordinates of 5.5249° N and 7.4946° E. It is a mining area, were clays are mine. The mining site far from dwelling area and 5 km form Umuahia town.

The main objectives of this work is to determine the radioactivity concentration, the radiological indices and the radiological impact to the miners, dwellers near the mining sites as well as the present and future radiological hazards associated with the soils and it application.

Method

In this work, the radionuclides such ^{40}K, ^{210}Pb, ^{226}Ra, ^{228}Ra and ^{232}Th were determine using Canberra (USA) High Germanium (HPGe) gamma ray (γ – ray) detector, p-type, in Institute for Energy and Nuclear Research (IPEN), Research Reactor Center (CRPq), University of Sao Paulo (USP), São Paulo, Brazil.

Results

Mean values of soil activity concentrations and mean values of the main radiological parameters are presented in tables 1, 2, and 3.

Table 1: Activity Concentration of Soil from Umuahia, Nigeria

Activity Concentration (Bqkg-1)				
^{228}Ra	^{228}Th	^{226}Ra	^{210}Pb	^{40}K
68±9	93±9	54±5	47±8	184±16

Table 2: Radiological Parameter of Soil from Umuahia, Nigeria

AD(nGyh^{-1})	AED(Svy^{-1})		RE(Bq.Kgh^{-1})	ELTRCR (OUT)$\times 10^{-3}$	ELTRCR (IN)$\times 10^{-3}$
	AED_{OUT}	AED_{IN}			
65	0.0797	0.3191	10645	0.243	0.973

Table 3: Radiological Parameter of Soil from Umuahia, Nigeria

GRI(Bq/Kg)	$I_nH_zI_x$	$E_XH_zI_x$	AGED	$A_{ct}U_zI_x$	ARI	$E_XR_T(\mu R/h)$
1,274	0.643	0.438	498.98	1.63	0.83	323,67

Conclusion

K-40 is much less below the 420 average word values while ^{226}Ra and ^{228}Th are 80% and 100% greater than the word average value. For the radiological parameter, AD, AED, $I_nH_zI_x$, $E_XH_zI_x$ are below the word values of 60, 0.08, 0.42, 1 and 1. For: RE,GR, ELTRCR, AGDE, E_XR_T ARI are higher than the word average values. Therefore, the soil is not suitable for construction and farming.

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