Primordial and Anthropogenic Radionuclides in soil samples of bauxite ore deposits site in Western Region of Cameroon

Presented by:

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My name is CAMEROON
OUTLINES

1. Introduction
2. Material and Method
3. Results and discussion
4. Conclusion
The primary goal of this study is to determine the level of natural radioactivity in the bauxite ore deposits site in Western Region of Cameroon.
Introduction

- The radiological impact analysis and radioecological significance of bauxite and red mud industry in the environment studied have revealed potential increase and changes of terrestrial gamma radiation.

- Mini-martap, located in the Menoua Subdivision of Western Region, Cameroon is suspected to be the largest bauxite ores deposit in Cameroon.

- The aims of this study were to measure and assess the baseline radioactivity levels before the mine starts processing the bauxite ore in the area.
Experimental procedures (1/3)

- 25 soil samples were randomly collected at a typical depth of about 10 cm from the top surface layer.

- The samples were air dried in an oven for 24 h at a temperature of 105°C. The dried samples were grinded into powder and sieved through a 2 mm wire mesh to obtain a uniform particles size.

- A dried residue of each soil sample was transferred into a thoroughly washed and dried 120 ml cylindrical container;

- Each container was hermetical sealed, labelled and stored for 30 days to establish secular equilibrium.
After the in-growth period, each sample was counted for 24 hrs on the characterised low-background gamma-ray spectrometry BEGe6530.
The analysis of the spectrums was done using Genie 2000 version 3.2 with integrated efficiency calibration LabSOCS software;

The 48 hrs counted background was taken to consideration during the analysis of the spectrum.
• The Radiological parameters were evaluated according to the following formulas:

\[
AD \ (nGy / h) = \sum_{i, j=1}^{3} F_i \times C_j
\]

\[
AOED / AIED (mSv / y) = AD \times DCF \times OF \times T
\]

\[
H_{ex} = \frac{A_{Ra}}{370} + \frac{A_{Th}}{259} + \frac{A_{K}}{4810} \leq 1
\]
Table 1: The mean Activity concentration of terrestrial Radionucleides were compared to other studies

<table>
<thead>
<tr>
<th>Location</th>
<th>Specific Activity (Bq/kg)</th>
<th>Références</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$^{226}$Ra</td>
<td>$^{232}$Th</td>
</tr>
<tr>
<td>Australian (bauxite ores deposit)</td>
<td>120-350</td>
<td>400-1050</td>
</tr>
<tr>
<td>Cameroon (South western)</td>
<td>130</td>
<td>390</td>
</tr>
<tr>
<td>South Cameroon</td>
<td>134</td>
<td>177</td>
</tr>
<tr>
<td>China</td>
<td>1–360</td>
<td>2–690</td>
</tr>
<tr>
<td>Camroon (volcanic area)</td>
<td>14.00</td>
<td>30</td>
</tr>
<tr>
<td>Portugal (Uranium mining)</td>
<td>200.00</td>
<td>91</td>
</tr>
<tr>
<td>Eastern Germany(Ronneburg)</td>
<td>370.00</td>
<td>45</td>
</tr>
<tr>
<td>IAEA (bauxite ores deposit)</td>
<td>10-900</td>
<td>35-1400</td>
</tr>
<tr>
<td>Cameroon (Fongo-Tongo)</td>
<td>121.2</td>
<td>141.7</td>
</tr>
<tr>
<td>World average</td>
<td>33</td>
<td>45</td>
</tr>
</tbody>
</table>
Results and discussion (3/3)

**Figure 1:** Radium Equivalent concentration and Absorbe dose rate

![Chart showing Radium Equivalent concentration and Absorbe dose rate](chart-image-url)
Results and discussion (2/3)

**Figure 2**: The Annual Outdoor Effective Dose values and Indoor for each sample.
Conclusion

- The observed average values of $^{226}$Ra, $^{232}$Th and $^{40}$K are comparable high than the recommended limit of normal areas by UNSCEAR;

- The outdoor gamma dose rate for the soil samples in this study is higher than the world average value of 60 nGy/ h;

- The average outdoor and indoor effective annual doses due to the natural radioactivity of the soil samples are lower than the recommended value of 1 mSv /y.

The radiological hazard indices ($Ra_{Eq}$, $H_{ext}$) are slightly higher than the world average values. This implies that gamma radiation from soil in this area might increase the radiological threat when used as a building material.