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Study of Gross Alpha and Gross Beta Activities in Rock Samples of Western Ghats in Kanyakumari District

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ABSTRACT

The present study was carried out to examine the gross alpha and gross beta activities in rock samples in Kanyakumari district. Twenty Four samples were collected from different locations in Western Ghats. The gross alpha and gross beta activities were measured by using zinc sulphide scintillation detector and low beta counter. In this present study the gross alpha activity was maximum at L22 (1397.85 Bq/Kg) and minimum at L7 (53.76 Bq/Kg) with an average of 582.44Bq/Kg and the gross beta activity was maximum at L2 (3815.79 Bq/Kg) minimum at L7 (833.33 Bq/kg) with an average of 2081.51Bq/Kg.

Keywords: Gross Alpha, Gross Beta, Western Ghats, Rock

INTRODUCTION

Radionuclides are found in air, water, soil, rock and everywhere in the Universe. There is no where on earth that one can get away from natural radioactivity [1]. Natural radioactivity arises mainly due to the radioactive nuclides present in different amounts in sediments, water and rocks. Almost all the rocks contain naturally occurring radionuclides such as ^{238}U, ^{232}Th and ^{40}K [2]. Available information indicates that the deposits of monazite on the coastal areas of Kerala and TamilNadu are formed due to the weathering of rocks in Western Ghats [3][8]. Natural Radioactive concentration depends mainly on geological and geographical conditions and appears at different levels in rocks from different geological regions (UNSCEAR 2000) [4].

SAMPLING AND SAMPLE PREPARATION

Fig.1 Location of the study area

For the present study, rock samples were collected from 24 places of Western Ghats in Kanyakumari district. Fig. 1 shows the location of the study area. Some locations were mentioned as the name of the nearby villages.

Basic component of our life support system contains measureable amount of radioactivity. The radio activities due to these components are found out by using different instruments. In this work, the gross alpha and gross beta in the rock samples are measured by using the Zinc Sulphide Scintillation Detector and Low Beta Counter.

ZINC SULPHIDE SCINTILLATION DETECTOR

An alpha counting system comprises of an alpha probe and counting electronics system includes high voltage supply to probe, a preamplifier, an amplifier, timer and scalar. The counter model SP 647A was used for the measurement. The PMT and crystal are placed n a light tight steel housing. So as to have very low background and have an efficiency of about 31.07%. The standard source ^{241}Am was used for detector calibrations.

LOW BETA COUNTER

The Counters consists of two or three G.M counters. The counters have a silver or gold foil window through which the beta particles travels and reach the gas chamber with isopropyl alcohol vapors and ionize the medium. The counter model BCS36A was used for this study. The standard source ^{40}K was used and the corresponding efficiency of the counter was about 38.16%.

Twenty Four rock samples were collected from the study region to measure gross alpha and gross beta activities. Each sample nearly 1Kg in weight was washed in distilled water and dried in an oven at nearly 110^{o}C to ensure that moisture was completely removed. Then the samples are grinded as a fine powder. About 0.006gms of powdered samples are spread as a fine layer in a aluminum planchet and its gross alpha and gross beta activity were measured using alpha and beta counter[5]. The samples were counted for 1000s.

RESULTS AND DISCUSSION

The results of the gross alpha and gross beta activity of five rock samples are presented in table1.

Table 1: Determination of Gross Alpha and Gross Beta activity of rock samples.

Sl.No	Sample Location	Gross Alpha (Bq/Kg)	Gross Beta (Bq/Kg)
1.	L_1	1129.03	1578.95
2.	L_2	806.45	**3815.79**
3.	L_3	483.87	1535.09
4.	L_4	215.05	1710.53
5.	L_5	268.82	1491.23
6.	L_6	591.40	1666.67
7.	L_7	**53.76**	**833.33**
8.	L_8	645.17	1578.95
9.	L_9	322.58	877.19
10.	L_{10}	698.92	3245.61
11.	L_{11}	913.98	1842.11

12.	L_{12}	537.63	1929.82
13.	L_{13}	107.53	1622.81
14.	L_{14}	376.34	2149.12
15.	L_{15}	376.34	2017.54
16.	L_{16}	645.16	2105.26
17.	L_{17}	537.63	2938.60
18.	L_{18}	752.69	2807.02
19.	L_{19}	1290.32	2192.98
20.	L_{20}	967.74	2675.44
21.	L_{21}	161.29	2456.14
22.	L_{22}	**1397.85**	2500.01
23.	L_{23}	430.11	2587.72
24.	L_{24}	268.82	1798.25

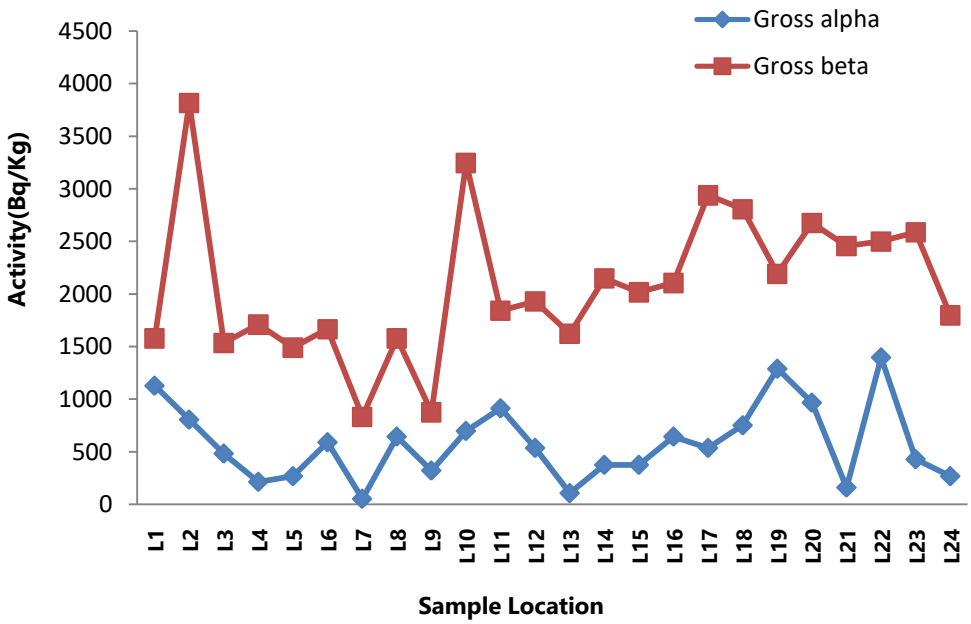

Fig 2: Gross alpha and gross beta activities for various places

The gross alpha activity of the rock samples collected from Western Ghats in Kanyakumari district were measured and tabulated in table.1. The gross alpha activities vary from lower value (53.76 Bq/Kg) was observed in L7 to higher value (1397.85 Bq/Kg) was observed in L22 with an average of 582.44Bq/Kg.

The gross beta activity was maximum at L2 (3815.79 Bq/Kg), while it is minimum at L7 (833.33Bq/kg) with an average of 2081.51Bq/Kg. The higher value of beta activity in L2 is due to the presence of ^{40}K, which is the natural beta emitter. The graph shows the random distribution of radionuclides which are emitting alpha and beta radiation. Some locations have higher activity whereas some places have very low activity.

CONCLUSION

In the present study, the graph shows that, the gross alpha and beta activities are randomly distributed in Western Ghats in Kanyakumari district. The gross alpha activity values varied from 53.76Bq/Kg to 1397.85Bq/Kg with an average of 582.44Bq/Kg, whereas the gross beta activity values varied from 833.33Bq/Kg to 3815.79Bq/Kg with an average of 2081.51Bq/Kg. From these results the gross beta activity is higher than the gross alpha activity in the collected rock samples. Hence this study will helps to prepare the baseline data for gross alpha and gross beta radioactivity in rock sample which will be used as finger print for the comparison of radioactivity level.

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