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Radiation Measurements *Assesing Radiation Sheilding Capacity of Concrete Containing different Types of Aggregates*

Mohammad Abid Thokar[1] **and Er. Shabina Masoodi**[2]

[1]Student Civil Engineering, SSM College of Engineering and Technology
[2]HOD Civil Engineering SSM College of Eng. & Tech
E-mail: [1]mohdabid4792@gmail.com, [2]ssm.masoodi@gmail.com

Abstract—*The Linear Attenuation Coefficient (μ,cm^{-1}) for concrete containing different types of Aggregates (with different Hardness and Specific gravity) has been measured. The Linear Attenuation Co-efficient measured with five concrete rectangular cells prepared with different types of aggregates, show variation in their linear Attenuation coefficients as per density i.e concrete sample with more density shows large Attenuation coefficient decreased with decreasing densities of concrete samples .it is concluded that by adding Aggregates with specific gravity higher in the concrete, is the best option for using concrete as Radiation shielding material.*

Keywords-*Ray shielding, Attenuation Coefficient, Granite, Concrete, Cs-137, Scintillation detector, Quartzite, Quartz, serpentine, iron punching.*

1. INTRODUCTION

Concrete as one of the main materials used in modern building construction, and its method of production is the subject of detailed scrutiny, particularly where the buildings are of critical importance such as hospitals, nuclear power stations, etc. Being common material its shielding capacity should be good. concrete having specific gravity higher than 2600 kilogram per cubic metre are called heavy weight concrete and aggregates having specific gravity higher than 3000 kilogram per cubic metre are called heavy weight aggregates. Keeping in view the harmful effects of radiations coming out particularly from radio diagnosis related practices on human body, attempts should be taken to improve shielding potential of concrete.

2. EXPERIMENTAL

2.1. Concrete production

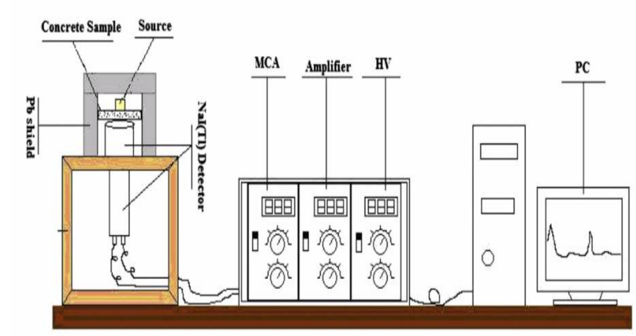
Five different types of concrete samples were produced by mixing normal sand having source as quartz, quartzite basalt, etc (free from foreign materials) with different type of aggregates having different Hardness and di-fferent specific gravity in ***1:1.5:3****. With w/c ratio of 0.42.The cement used is 43 Grade TCI.*

2.2. Sampling and Sample Preparation

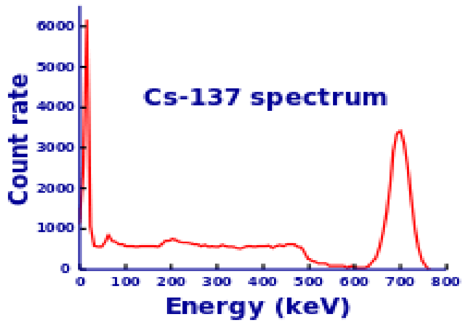
*A total of four samples of different aggregates were collected and were investigated by experts. About 3kg of every sample was taken and crushed to small size pieces .the size of concrete cells was taken as 5*5*1cm with thickness as 1cm. Aggregates size used was below 6 mm, after compaction and then proper curing it was allowed to attain its full strength. After 28 Days the samples were taken for test.*

2.3. Instrumentation and calibration

Attenuation coefficient measurement were performed by scintillation detector employing a detector aving diameter of 5 cm. It consists of high resolution NaI (Tl). Crystal, connected to, Multi channel Analyser (MCA)a schematic view of the detection system is shown in fig. Below.



Analysis was performed using ***Cassy Lab View.*** *The □-Rays were obtained from Cs-137 (662 KeV) source. The □-Ray spectrum obtained with a Cs-137 is as shown below*

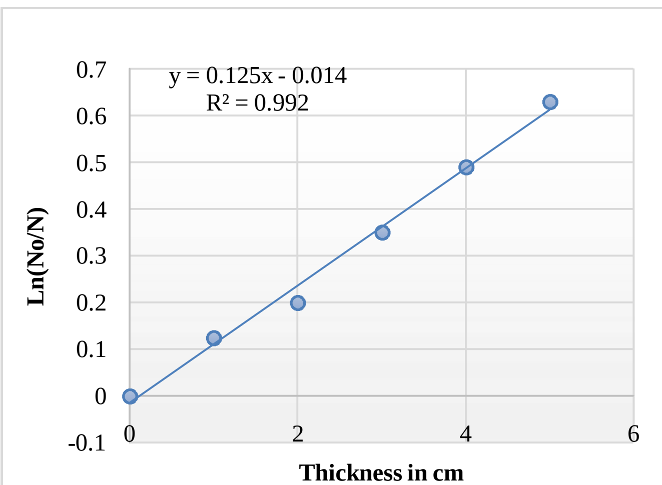


The linear Attenuation coefficient can be expressed as

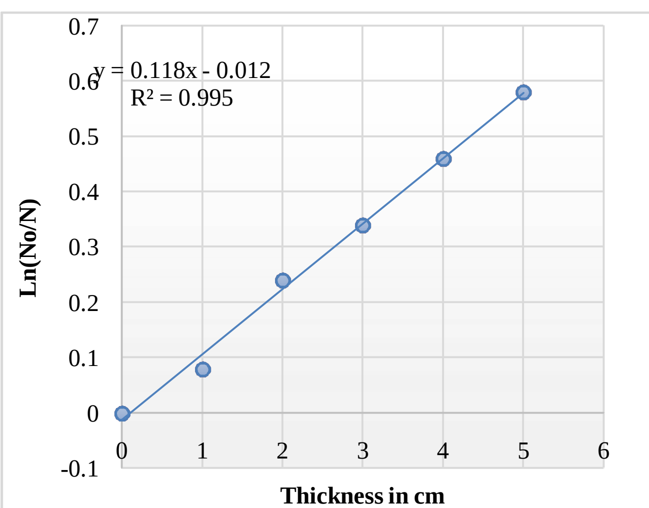
μ = 1/x ln (No/N)

where x is the sample thickness and N and No are the number of counts recorded in the detector with and without absorber respectively. By plotting ln (No/N) vs x, the value of μ was calculated from the slope.

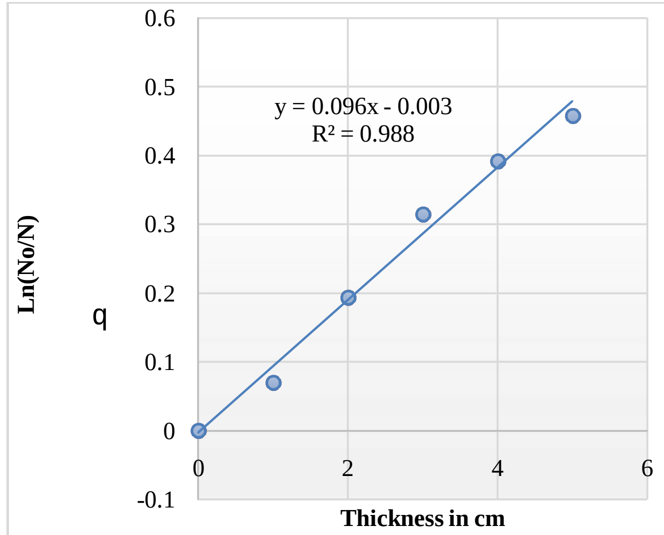
1. IRON PUNCHINGS



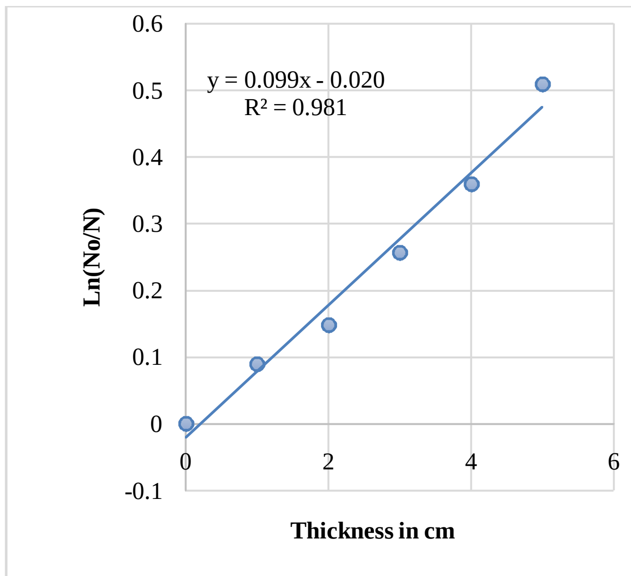
2. QUARTZITE



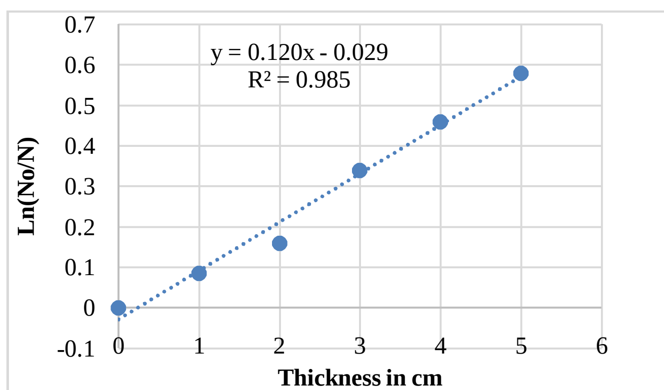
3. QUARTZ



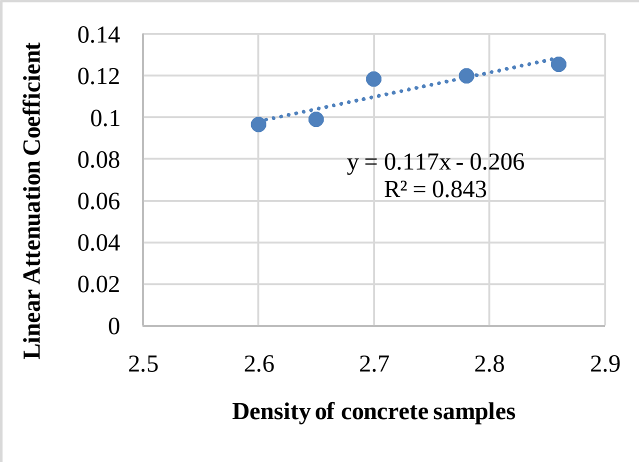
4. GRANITE



5. SERPENTINE



6. DENSITY



DENSITY OF CONCRETE SAMPLES (g/cc)	AGGREGATE TYPE (NAME)	LINEAR ATTENUATION COEFFICIENT (μ,cm^{-1})
2.86	IRON PUNCHINGS	0.1256
2.78	SERPENTINE	0.1201
2.70	QUARTZITE	0.1184
2.65	GRANITE	0.0991
2.60	QUARTZ	0.0965

3. RESULTS AND CONCLUSION

The linear attenuation coefficient (µ) for five different types of concrete were calculated at photon energy 662KeV.

From the study it is seen that concrete sample with more density shows better performance in absorbing gamma rays.

So it is concluded that linear attenuation coefficient depends upon density of material.

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