Study Attenuation Coefficients of Leaves (Ficusreligiosa)

M.D. Sharma

Department of Physics, Govt. Dungar College, Bikaner-334001, Rajasthan, INDIA
Email: mdsharma.phy@gmail.com

Abstract: In this paper, the count with the applied voltage of GM counter is studied. The leaves of Ficusreligiosa is used as scatter to study attenuation coefficient for beta particle. The investigation is further extended to find attenuation coefficient for fresh leaves and dried leaves. The aim is to study the attenuation coefficient for various materials used in our daily life beside the metal which is well known as good attenuator.

INTRODUCTION

Photons and particles emitted in the reaction of nucleus of atom are known as nuclear radiation. Nuclear radiation also refers as ionizing radiation [1]. Alpha particles, beta particles, neutrons, muons, mesons, positrons, and cosmic rays etc. emitted in nuclear reaction, which are some of the examples of nuclear radiations. The device used to detect these nuclear radiations are known as nuclear detector [2-3]. Nuclear detectors are many based on ionization and excitation of atoms by charged particles.

The distance travel by the radiation depends on the type of radiation, which is defined as the ability to penetrate. Alpha and beta particles can be easily blocked due to less penetration power. While gamma rays, x-rays, and neutrons can travel a large distance [4]. There are so many application of radiations in various field such as weapon, power generation, medicine etc. In medical or other constructive application, the control travel of radiation is required. Therefore, the study to fine the material with high attenuation and low cost is more interest.

In this paper, the count with the number of leaves (Ficusreligiosa) is study in GM with CS137 source. The attenuation coefficient of fresh and dry leaves of Ficusreligiosa are obtained using GM counter.

MATERIAL AND METHOD

Geiger-Müller (GM) [5] counter is nuclear detector based on ionization of atom. In GM counter, the electric field between cathode and anode is still greater, which increases the ionization current due to secondary ionization of gas molecules. The amplitude of output pulse is independent to the energy of incident radiation particle, due to high secondary ionization of gas molecule. Because of the simple design, GM counters are widely used for detecting alpha and beta particles and gamma photons. CS 137 radiation source is used for the present study.

Ficusreligiosa or sacred fig is a species of fig native to the Indian subcontinent[6] that belongs to Moraceae, the fig or mulberry family. Leaves of Ficusreligiosa are used as scatter to find the attenuation coefficient for fresh and dry cases.

RESULT AND DISCUSSIONS

First, the count with applied voltage is plotted as shown in figure 1. It is clearly seen from figure 1 that GM counter starts counting after a certain value i.e. the threshold voltage. The threshold value for this case is about 330V. After the threshold voltage, there is constant count in certain region which is known as plateau region of GM counter. The mid voltage of this region is taken as operating voltage to get actual errorless count for various study.
The operating voltage \( (V_{\text{op}}) \) is taken as \( V_{\text{op}} = (V_1 + V_2) \), where \( V_1 \) and \( V_2 \) are initial and end point of plateau region. From figure 1, the voltage \( V_1 \) and \( V_2 \) are 350V and 670V, respectively. Therefore, the operating voltage \( (V_{\text{op}}) \) is equal to 510V, which is used for the further study.

![Figure 1](image1.png)

**FIGURE 1.** The count with applied voltage

Next, the leaves of ficus religiosa (Peepal) is used as scatter to study the attenuation coefficient. For this study, the fresh leaves and dry leaves of ficus religiosa are used for the further study. The count with the number of fresh leaves of ficus religiosa is plotted at operating voltage 510V, which is as shown in figure 2.

![Figure 2](image2.png)

**FIGURE 2.** The count with number of fresh leaves

From figure 2, it is clearly seen that the count decreases with the number of fresh leaves of ficus religiosa. With the curve fitting it is achieved that the variation is exponential decreasing with the number of leaves. The attenuation coefficient is 0.155/leave. The thickness of fresh leaves (ficus religiosa) is 0.02 cm used for the study. Therefore, the attenuation coefficient of fresh leaves (ficus religiosa) is 7.75/cm\(^{-1}\). After that the leaves of ficus religiosa is dried about one week and the studied further the count with number of dry leaves (ficus religiosa), which is plotted in figure 3.
From figure 3, it is clearly seen that the variation of count with the number of dry leaves (Ficusreligiosa) is similar figure 2. With the curve fitting, it is achieved that the variation is exponential. The attenuation coefficient is achieved as 0.115/leave. But the thickness of dry leave is remained as 0.012cm. Therefore, the attenuation coefficient is achieved as 9.583 cm\(^{-1}\). As the leaves are dried that the water contain removed and density increases. So, the attenuation coefficient of dry leave is higher than the fresh leaves. The dry leaves of Ficusreligiosa shows better attenuation compared to fresh leaves. Dry leaves can be used for better results.

REFERENCES