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ATTENUATION COEFFICIENT OF GLUCOSE SOLUTION USING GAMMA SOURCE

L.M. Chaudhari

Nuclear Physics Research Laboratory, Dept. of Physics, Nowrosjee Wadia College, Pune-411001(M.S.) India

Abstract

The linear and mass attenuation coefficient plays an important role in a agriculture, industry, science & technology, basic quality, medicines and forensics etc. The attenuation coefficient of glucose solution with different concentration by using different gamma ray energy studied. The results are in the graphical form and it valid the gamma absorption law.

Key words: *Gamma source, Cane sugar , milk, gamma ray spectrometer, NaI detector.*

Introduction

The study of interaction of gamma radiations with the materials of common and industrial use, as well as of biological and commercial importance has become major area of interest in the field of radiation science. For a scientific study of interaction of radiation with matter a proper characterization and assessment of penetration and diffusion of gamma rays in the external medium is necessary. The mass attenuation coefficient usually depends upon the energy of radiations and nature of the material. For characterization the penetration and diffusion of gamma radiation in any medium, the roll of attenuation coefficient is very important.

An extensive data on mass attenuation coefficients of gamma rays in compound and mixtures of dosimetric interest have been studied by Hubbell[1]in the energy range of 1 kev to 20 MeV. An updated version of attenuation coefficients for elements having atomic number from 1-

92 and for 48 additional substances have compiled by Hubbell and Sheltzer[2], and some other scientists[3-7]. The reports on attenuation coefficients measured by researcher's reported[8-21] for different energies for various samples in solid as well as liquid.

In view of the importance of the study of gamma attenuation properties of materials and its various applications in science, technology, agriculture and human health , we have embarked on a study of the absorption properties of cane sugar in milk samples.

The absorption of gamma rays is expressed as:

$N=N_o\exp(-\mu x)$ (1)

Where N_o is the number of particles of radiation counted during a certain time duration without any absorber, N is the number counted during the same time with a thickness *x* of absorber between the source of radiation and the detector, and μ is the linear absorption coefficient.

The mass absorption coefficient of milk, μ_m defined as,

$\mu_m = \mu/\rho$ (2)

Where, μ_m is the mass absorption coefficient and ρ is the density of milk sample. The unit of μ is cm^{-1} and that of μ_m is cm^2/g.

Experimental arrangement:

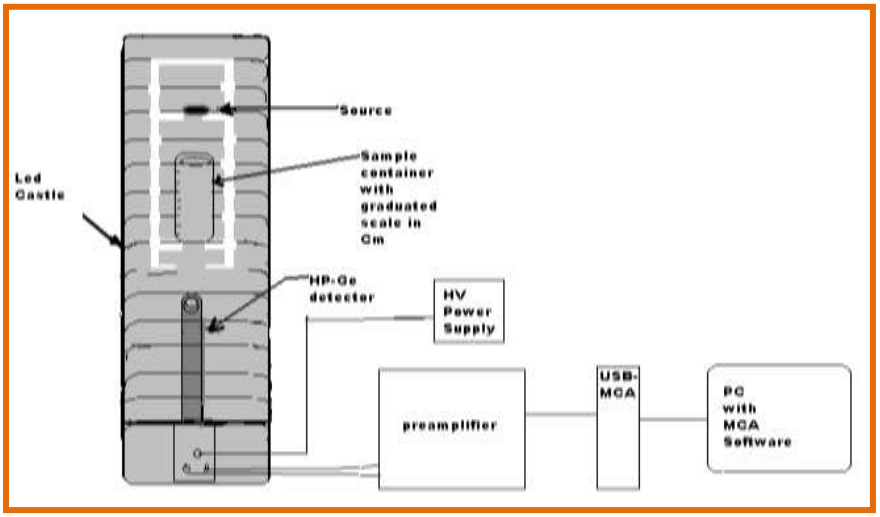
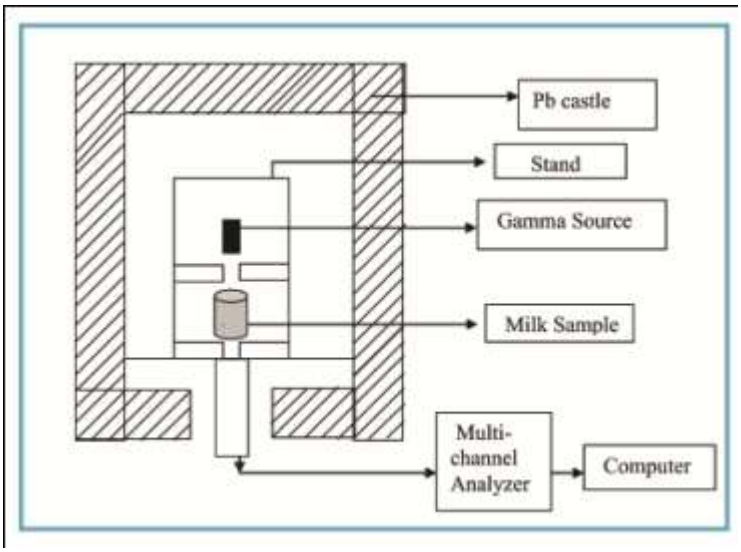


Figure - 1: Experimental Set up

Experimental block diagram:



Preparation and Glucose Solution:

Glucose is the water soluble. It dissolves in water emergently but after sometime glucose converted to sucrose solution.

Preparation of concentration solution (1%)

1g of glucose inform of solid was taken in beaker and then stirred with 100 ml of water at room temperature for 15-20 minute. After overcoming the true solution is solution. This solution is diluted to 150ml using volumetric flask. The solution thus obtained has concentration 1g/100cc i.e. 1%

Preparation of solution of other concentration:

Other more dilute solution of glucose were prepared by using other concentration have the same process to from new 10 concentration to prepare 100ml of each solution was calculated using equation $N_1V_1=N_2V_2$.

Experimental setup and Radioactivity Measurement

The schematic representation of the experimental setup is shown in fig. cylindrical beaker 3.2cm was placed just below the shielded multi gamma source. We use various source of gamma rays for energy dependence of the substances. The sources are listed; they are obtained from Electronic of India.Ltd. Hyderbad. the source was shielded I Canberra make shield are shown given below.

Source	Energy (kev)	Normal activity (μCi)	Half life
Cs-137	662	3.26	30 Year

Observations: Table 1 shows the experimental values of path length (cm) and log (I_0/I) with different concentrations:

Result

	log (I_0/I)									
path length(cm)	**1%**	**2%**	**3%**	**4%**	**5%**	**6%**	**7%**	**8%**	**9%**	**10%**
1	0.0197	0.0127	0.0238	0.0186	0.0117	0.0174	0.0216	0.01	0.0183	0.0162
2	0.034	0.0241	0.0396	0.0345	0.0141	0.0205	0.0394	0.02601	0.0299	0.0247
3	0.036	0.0398	0.0476	0.0468	0.0309	0.0374	0.0575	0.0312	0.0508	0.0353
4	0.0417	0.0481	0.05312	0.0525	0.0401	0.0476	0.0663	0.0513	0.0685	0.059
5	0.0591	0.0697	0.0647	0.0738	0.0487	0.0784	0.0991	0.0735	0.0924	0.0756
6	0.0778	0.0807	0.083	0.1059	0.0663	0.0813	0.114	0.0853	0.1154	0.0998
7	0.0931	0.0977	0.0938	0.1106	0.0855	0.1045	0.1341	0.1206	0.1408	0.1213
8	0.1176	0.1244	0.1217	0.1302	0.1076	0.1173	0.1683	0.1378	0.1656	0.1468
9	0.142	0.1455	0.1438	0.1456	0.1364	0.1583	0.1932	0.1496	0.1936	0.1697
10	0.1517	0.1537	0.1645	0.1747	0.16	0.1833	0.2152	0.1779	0.2234	0.1848

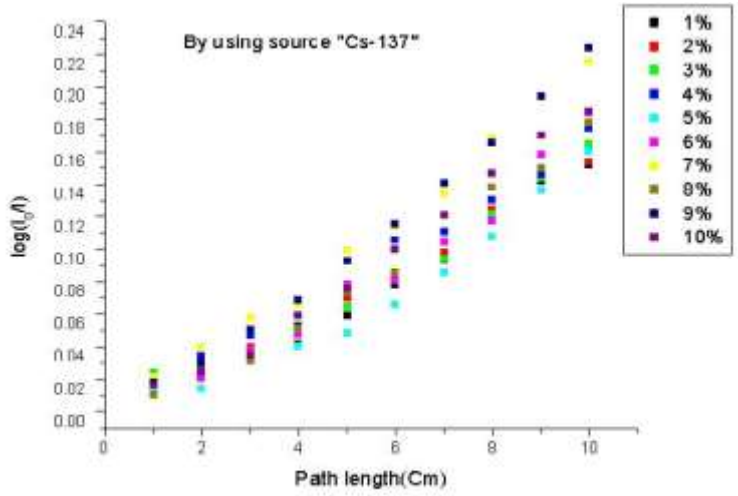


Figure 1

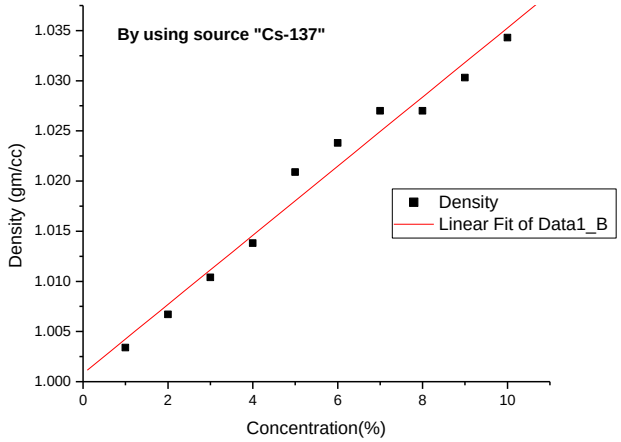


Figure 2

Concentration (%)	**Density (ρ)**	**Linear attenuation coefficient (μ)**	**Mass. Attenuation coefficient (μ_m)**
1	1.00342	0.008452	0.008424
2	1.00675	0.006991	0.006944
3	1.01037	0.006967	0.006896
4	1.01378	0.007746	0.007641
5	1.02094	0.005723	0.005606
6	1.02378	0.003769	0.003681
7	1.02704	0.007234	0.007044

8	1.02704	0.001483	0.001444
9	1.03029	0.006779	0.006579
10	1.03428	0.003398	0.003285

Conclusion: The linear and mass attenuation coefficients are studied with different concentrations using source Cs-137. The results valid absorption.

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