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ORIGINAL ARTICLE

Theoretical Calculation for Pure Epoxy and Lead by Monte Carlo

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ABSTRACT

Theoretical calculation for pure epoxy and lead by Monte Carlo code in MATLAB 14 was used in this research, Structure of these simulation can be very useful to gain a useful knowledge of different process and how these relate for each other's. The primary and the physical process which associated with gamma ray's transmission. Most interactions through matter is scattering, photoelectric effects, and pair production. Effects of a gamma ray passing and interacts with a medium are the results of multiple independent interactions. With heavier elements, a lower photovoltaic cross-section resulted in wide path length for photons. The light elements, such as epoxy, the dominant spectrum of energy transmitted for epoxy is 0.7 MeV. For epoxy, gamma rays deposited energy with the photoelectric absorption and the Compton scattering, but for driving, the dominant precipitated energies are by pair formation. The primary interactions are predominant with the epoxy medium is either by photoelectric or by Compton reaction and the probabilities interactions depending upon cross-sections.

Keyword: epoxy composites, gamma irradiation, Monte Carlo

INTRODUCTION

The main basic of the Monte Carlo software is the random numbers. The loops of integers from 0 to range 1. The subroutines from the programming of computer returns typically to the intervals from 0.000 and 1.000 distribution. The physical and chemical properties of ZnO nanoparticles such as size, size distribution, crystallinity, morphology melting point, band gap, optical and electronic properties strongly dependence to preparation method of synthesis of this material. The optical properties of particles were studied with UV-Vis an FTIR absorption spectrum by using Monte Carlo methods. The Raman spectrum measurements were carried out using a micro-laser Raman spectrometer forms the ZnO nanoparticles[1]. Monte Carlo methods differ from the bigger stages of simulations techniques. They explicitly calculate random events the outcome. Normally, the dates of the photons are calculated from millions to billions, and then the deposited energies for every voxel of mathematical phantom are distributes tissue masses of the voxels, this results in the doses which absorbed of the voxel – function as the energy transferred per units masses.

The development of computers and its application became faster and billions of photons simulations to determine radiation doses for medical diagnostic and treatments application.

The technique of SEM and X-ray diffraction (XRD) in the copolymer matrix or composites of polymers with other elements. The applications of Nanostructures characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and atomic force microscopy (AFM)are also uses for good results. [2].

The simulation: The algorithm: It is easy to set up an algorithm for transmitting gamma-rays in a medium for simple geometric shapes such as a layer with infinite parallelograms or a cylinder. For simplicity, let us assume that the medium consists of only one substance, described the properties and characteristics materials.

In Monte Carlo, stochastic processes are simulated. The information that should be randomly generated is s, Φ. A simple way to generate variable y as random generation according to probability of the density p(x) which defined as interval (a, b) depends that r is :

$$r = Q(y) = \int_a^y p(x)dx \quad (1)$$

The distributed probability at interval (0 , 1). Hence, y can obtained from

$$y = Q^{-1}(r) \quad (2)$$

Random number r between (0,1) and the computer provide its expressions. The method is feasible with the Q(y) as inverted function. By applying the presence method. The generation achieve with the path crosses between every two interactions ,where **s** represent the random variable and can be written with associated to r as

$$s = -\frac{\ln r}{n\sigma} \quad (3)$$

Generation of Φ can be used by the basically applied with the same manner as refer with equation (4) ,

$$\Phi = 2\pi r \quad (4)$$

The program: To implement the algorithm previously described by the authors. Converting any computer languages is easy. Scheme algorithm flow represents in Figure (1). The all fundamentals parameters represent the molecule weights, and energy applied. Program then calculates every different cross-section at first reaction. The differentials cross-section of all energies obtained and can classified with its probabilities. [2, 3].

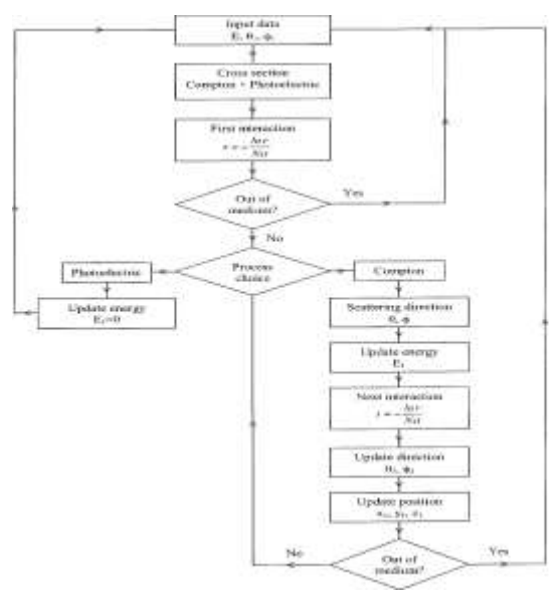

Figure 1: Gamma rays Flow diagram for the simulation of interaction with matter.

RESULTS

Figures (2, 3) shows the simulated spectrum of the energy transferred of the lead and epoxy. The comparison of these figures represents clearly that the dominant energy transferred of the lead at around 1.2 MeV. The photoelectric of low cross section clearly with photons associated in longer path lengths of heavy elements [4]. Light elements, like epoxy, the dominant spectrum of the energy transferred of the epoxy round 0.7 MeV. For epoxy, gamma ray has losses energy by photoelectric absorption or by scattering of Compton, but for lead the dominant deposited energy by pair creation [5].

Figures (4, 5) shows the simulated energy distribution of transmitted photons in lead and epoxy, respectively. The histograms show that the distribution of energy of transmitted quantum of photons in lead at around 1.2 MeV, energy distribution in epoxy at around the range (0.4-0.8) MeV with the transmitted of projectile photons.

Figures (6, 7) show the simulated distribution of energy of photons backscattered of lead and epoxy respectively. The range distribution of backscattered photons of lead are more predominate than energy range distribution of backscattered photons of epoxy as shown in the above histograms.

For light elements such epoxy, the agreement is very good. However, for light elements, incoherent scattering is dominant [1].

The angle distribution of transmitted photons of epoxy was most Predominate than its of lead at the range from (0-2) of the zenith angle and less sharply at the other degrees as shown in figures (8, 9). The other case the is scattered photon with respect to the all directions of polar and azimuthal angles θ and Φ, respectively. Value of Φ belong to a uniform distribution between 0 and 2π with respect to probability.

Figures (10, 11) show the simulated of the angle distribution of backscattered photons of lead and epoxy, respectively. The sharp lines of histograms of epoxy represents the photons often leave medium as a result of suffering depositing energy that smaller than the energy of the incident photon [7].The sharp lines appears that the angle distribution of backscattered photons of lead at (170) degree of zenith angle [8].

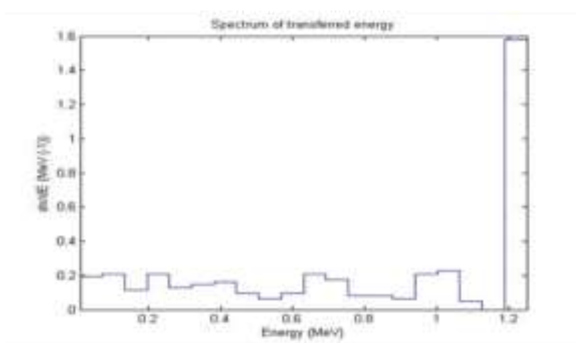

Figure 2: Spectrum of transferred energy in Lead

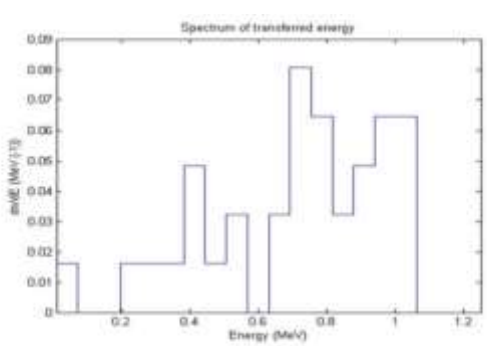

Figure 3: Spectrum of transferred energy in Epoxy

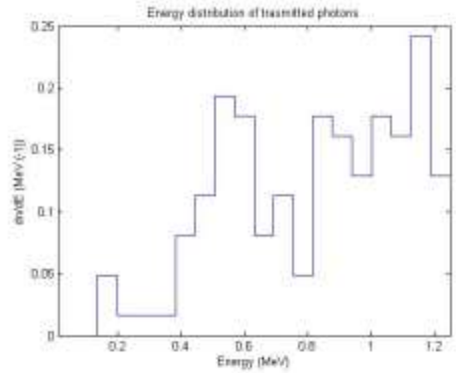

Figure 4: Transmitted photons in Lead as a function of Energy distribution .

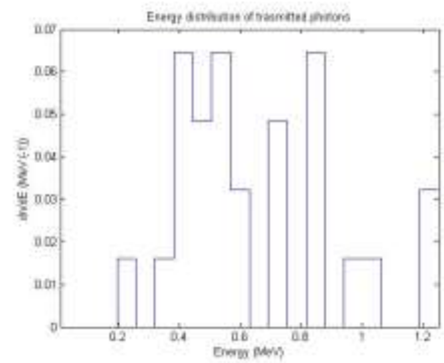

Figure 5: Energy distribution of transmitted photons in Epoxy

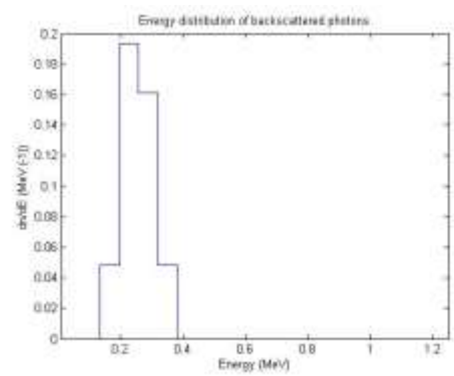

Figure 6: Energy distribution of Lead as a function of Backscattered photons.

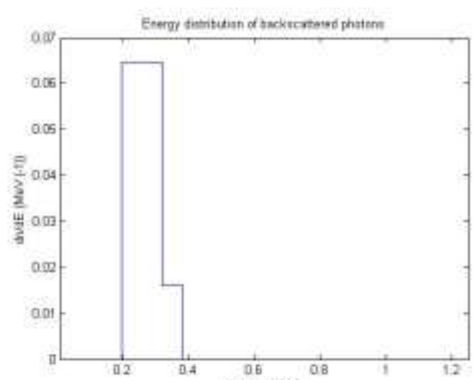

Figure 7: Energy distribution of Epoxy as a function of Backscattered photons.

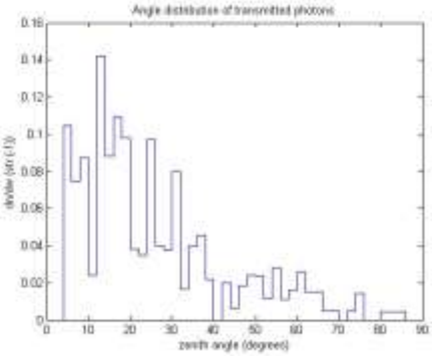

Figure 8: Angle distribution of transmitted photons in Lead

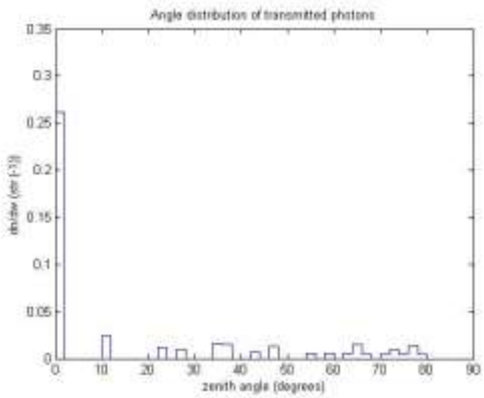

Figure 9: Angle distribution of transmitted photons in Epoxy

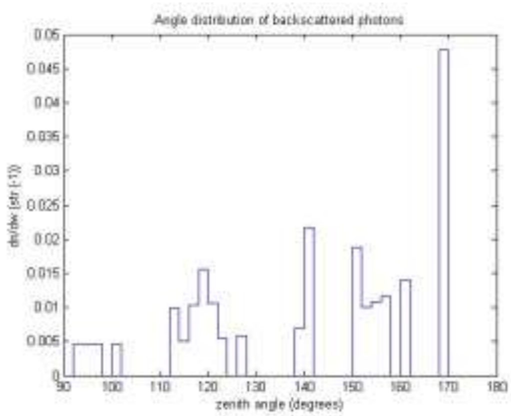

Figure 10: Angle distribution of backscattered photons in Lead

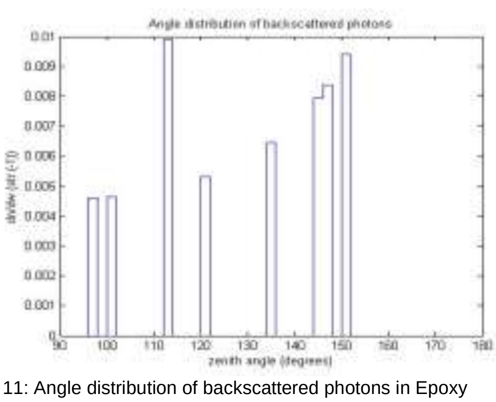

Figure 11: Angle distribution of backscattered photons in Epoxy

CONCLUSIONS

The Monte Carole method Simulation of gamma rays with an energies of about one electron volt in a medium. The related processes are photoelectric absorption and other predominant reactions by this simulation with good accuracy comparisons with the other programs . Klein explains cross section of the compounds , then latter roughly described with a developed the analytic formula. The energies in the range of pair creation cross-sections, ơ, is significant compared to scattering of the Compton is well above one MeV; for light items. The algorithm is also applicable to the energies are much higher than 1 megaelectronvolt. The software can be used as a tool to help researchers learn about the interaction of gamma rays with matter.Most of these methods are possible to obtain results ,but they also depend on their accuracy. Structural, optical and magnetic properties of nanostructures can characterize by X-ray diffraction (XRD), scanning electron microscopy (SEM), Atomic force microscope (AFM), UV–Vis absorption; Fourier transformed infrared (FTIR) and vibrating sample magnetometer (VSM) technique[10]. Material and energy properties can be easily tested and verified. Algorithm for calculating the deposited energies in water cylinder as function of depth and against radial distance. The shape simulated also of the NaI flash line then compared this shape with the spectrum measured .

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