***Abstract No: 89*** ***Physical Sciences***

# COMPARISON OF X-RAY ATTENUATION IN THE ENERGY RANGE OF 50-80 keV IN ALUMINIUM AND ZIRCON MINERAL ENCASED IN EPOXY MATRIX

**A.D.K.M. Weerasekara[1], V. Sivakumar[2*], C.P. Jayalath[2], A. Jayasinghe[3], T.M.W.J. Bandara[2], K. Wijayaratne[2], D.M.T. Gnanarathne[2] and D.K.K. Nanayakkara[4]**

*[1]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.*
*[2]Department of Physics, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka.*
*[3]Department of Radiography/Radiotherapy, Faculty of Allied Health Sciences, University of Peradeniya, Peradeniya, Sri Lanka.*
*[4]Nuclear Medicine Unit, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka.*
*[*]vsiva@sci.pdn.ac.lk*

X-rays are ionising radiation that can penetrate and be absorbed in varying degrees by different materials. They are used in a range of applications, including radiography. However, exposure to X-rays can have harmful effects. Hence, the appropriate use of radiation shielding is essential to prevent unnecessary exposure to radiation for radiation workers, patients, and the general public. Lead and lead-based compounds are commonly used as shielding materials. Given the hazards associated with lead-based compounds, there is a growing interest in developing lead-free shielding materials that can offer comparable shielding properties. The project aimed to synthesize a lead-free and cost-effective shielding material that could attenuate X-rays in the energy range of 50-80 keV using locally available minerals. Samples with various thicknesses were prepared using 80 wt% zircon sand with 150 µm particle size and by using epoxy as the matrix. These prepared samples were exposed to X-rays with energies ranging from 50 keV to 80 keV in 10 keV increments, with a standard aluminium step wedge as the reference. Images were obtained using a Fujifilm computed radiography system. Subsequently, grayscale values of the exposed regions of the images were processed by a software tool developed using Python programming language. The grayscale values of the prepared samples at various thicknesses were compared with those of aluminium at various thicknesses for each energy value. For the energy range mentioned above, the prepared composite samples with thicknesses varying from 1 mm to 4 mm exhibited an attenuation comparable to those of aluminium with 9 mm to 33 mm thicknesses. This study presents an opportunity to develop radiation shielding materials containing locally abundant natural minerals, such as zircon, for radiation protection in medical diagnostic procedures.

*Financial assistance from the University Research Council, University of Peradeniya, Sri Lanka (Grant No. 265) is acknowledged.*

**Keywords:** Lead-free materials, Minerals, Radiation protectoin, X-ray shielding, Zircon