Name: Bassam M. M. Abunahel

Email: basamnahel@gmail.com

Home institute: Al-Azhar University-Gaza, Jamal Abdel Naser St., Gaza Strip, Palestine

Host institute: School of Physics, Universiti Sains Malaysia (USM),11800, Penang, Malaysia

Thesis title: Comparative Study of X-ray attenuation in n-Bi_2O_3/epoxy-PVA fabricated by different sample preparations

ABSTRACT

In recent time, polymers have gained much attention from the X-ray shielding technologists as a replacement to the lead glass due to their unique properties such as the optical transparency, low manufacturing cost, and toughness. In addition, the magnitude of polymer properties has been improved with filler addition during the synthesis process. The preliminary study aimed to investigate the X-ray attenuation capability of composites prepared from the dispersion of different weight percentage (wt%) of bismuth (III) oxide nanoparticles (n-Bi_2O_3) within epoxy-polyvinyl alcohol (PVA) matrix using electrospinning melt mixing as a method of filler dispersion. The fabricated samples were characterized using scanning electron microscopy (SEM) and The characteristics of the X-ray attenuation were compared as a function of X-ray tube voltages using both the mammography and general radiography units. Results indicate that the X-ray attenuation by the n-Bi_2O_3/epoxy-PVA matrix polymer composites are distinctly higher than that of the electrospun n-Bi_2O_3/epoxy-PVA nanofiber mats with similar filler loading (wt%) and investigated X-ray tube voltage. This is due to the higher density of matrix polymer composites compared with the electrospun nanofiber samples. This lower density was due to the high nanofibrous porosity occurred within the electrospun n-Bi_2O_3/epoxy-PVA nanofiber mats. In addition, the mass attenuation coefficient (μ_m) of the matrix polymer composites, as well as the electrospun nanofiber

mats, increased with increasing n- Bi_2O_3 loading, except for the electrospun n-Bi_2O_3/epoxy-PVA nanofiber mat containing 12 wt% of n-Bi_2O_3. This sample showed higher porosity compared with other electrospun filler/epoxy-PVA nanofiber mats which cause a sudden decrease in the μ_m. Moreover, the matrix polymer composite with 2 mm thickness and ≥ 8 wt% n-Bi_2O_3 loading can be used as a shielding material for the X-ray tube voltages (25 – 35 kV) operated by the mammography unit.