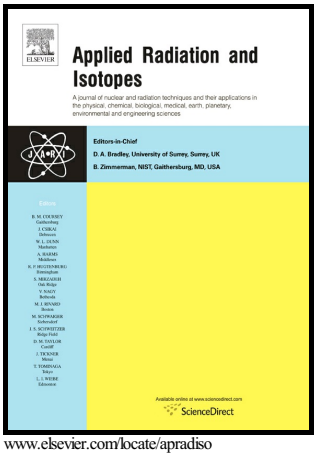

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X-RAY SHIELDING PERFORMANCE OF THE EPVC COMPOSITES WITH MICRO- OR NANOPARTICLES OF WO_3, PbO OR Bi_2O_3

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Highlights

I. EPVC composites with Bi_2O_3, PbO or WO_3 can be used for the diagnostic X-ray shielding.
II. Composites with Bi_2O_3 nanoparticles and PbO microparticles provide best attenuation.
III. The lowest HVL and mean free path values were found for the composites containing PbO nano- or microparticles.
IV. Composites containing nanoparticles attenuate better than the corresponding composites with microparticles.
V. Among the composites with nanoparticles, the materials containing Bi_2O_3 or PbO provide best and similar attenuation.

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ABSTRACT

Attenuation characteristics (mass attenuation coefficient, HVL and the 0.5-mm Pb equivalent thickness) of EPVC composites with micro- or nanoparticles of WO_3, PbO, or Bi_2O_3 with respect to diagnostics X-rays (40 – 100 kVp) were studied. The composites with nanoparticles outperform the similar composites with microparticles in some respects. Among the composites with nanoparticles, the Bi_2O_3- and PbO-containing composites perform similarly. Thus, Bi_2O_3 can be used as a suitable alternative to PbO in shielding designs.

Keywords: shielding, attenuation, nanoparticles, microparticles, Bi_2O_3, PbO, WO_3

1. INTRODUCTION

X-rays with energies in the keV range are often used in interventional image-guided procedures and in diagnostic radiology, e.g., computed tomography (CT) (Kim *et al.*, 2009). In order to avoid unwanted hazards from these kinds of radiation, a variety of shielding materials are used to attenuate or even completely absorb the photons. Unlike alpha, beta and some other radiations,