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# Fabrication, characterization and gamma rays shielding properties of nano and micro lead oxide-dispersed-high density polyethylene composites

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## Abstract

Polymer composites of high-density polyethylene (HD-PE) were filled with powered lead oxide nanoparticles (PbO NPs) and bulk lead oxide (PbO Blk) prepared with filler weight fraction [10% and 50%]. These polymer composites were investigated for radiation-shielding of gamma-rays radioactive point sources [<sup>241</sup>Am, <sup>133</sup>Ba, <sup>137</sup>Cs, and <sup>60</sup>Co]. The polymer was found to decrease the heaviness of the shielding material and increase the flexibility with the metal oxide fillers acted as principle radiation attenuators in the polymer composite. The prepared composites were characterized by Fourier transform infrared spectrophotometer (FT-IR), X-ray diffraction (XRD), thermogravimetric analysis (TGA), scanning electron microscope (SEM), Brunauer-Emmet-Teller surface area (BET) and field emission transmission electron microscope (FE-TEM). The morphological analysis of the assembled composites showed that, PbO NPs and PbO Blk materials exhibited homogenous dispersion in the polymer-matrix. Thermogravimetric analysis (TGA) demonstrated that the thermal-stability of HD-PE was enhanced in the presence of both PbO Blk and PbO NPs. Among the composite combinations, HD-PE/PbO nanocomposite yield better density polymer matrix. The results declared that, the density of polymer composites was increase with the percentage of filler contents. The highest density value was identified as 1.745 g.cm<sup>-3</sup> for 50

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