

**Title:** Investigation on radiation shielding potentials of barium calcium aluminosilicate glass material using silicon carbide nanotubes reinforcement

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**Abstract:** This work investigated the gamma ray attenuation power of barium calcium aluminosilicate glass by using silicon carbide nanotube modifiers. Shielding efficiency of BaO–15CaO–5Al<sub>2</sub>O<sub>3</sub>–10B<sub>2</sub>O<sub>3</sub>–35SiO<sub>2</sub> was investigated by adding different concentrations of silicon carbide nanotubes (10, 15, 20, 25 mol %). Amorphous and fine characteristics of the prepared glass materials were analyzed using XRD and FTIR techniques. In the results obtained, absence of sharp peaks in the XRD pattern revealed that the prepared glass was amorphous. Analysis of the radiation shielding properties was tested against gamma radiation by using PHY-X/PSD software. Various shielding parameters such as linear attenuation coefficient, mass attenuation coefficient, half value layer, tenth value layer, mean free path, and effective atomic number were determined to access the radiation shielding strength of the prepared samples. From the obtained results, composites of barium calcium aluminosilicate and silicon carbide nanotubes (sample 1) with higher values of mass attenuation coefficient (32.92 cm<sup>2</sup>/g) and effective atomic number (52.02) provided superior gamma ray attenuation. Results also revealed that the density and chemical composition of the prepared glass samples strongly influence photon interactions and weakly influence electronic interactions during the photon attenuation process. The results demonstrated that increasing the weight fractions of silicon carbide nanotubes in the glass samples increases the shielding properties.

**Keywords:** Gamma ray attenuation, Radiation shielding, Half value layer (HVL), Tenth value layer (TVL), Mean free path (MFP), Effective atomic number ( $Z_{\text{eff}}$ ), X-ray diffraction (XRD)

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