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# Impact of Coconut Shell Ash on the Gamma Radiation Shielding Properties of Borotellurite Glass System

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In this study, gamma radiation capability of glass systems made up of a mixture of boron and coconut shell ash (CSA) doped with varying concentrations of tellurium-dioxide (TeO2) (BTC1–BTC5) were investigated with the composition 58CSA–(42–x)B2O3–xTeO2 (where x = 0.1, 0.2, 0.3, 0.4, and 0.5 mole%). The glass samples were fabricated via the melt-quenching technique at 1000oC melting temperature. The mass attenuation coefficient (MAC), linear attenuation coefficient (LAC), half value layer (HVL), tenth value layer (TVL), mean free path (MFP), and effective atomic number (Zeff) were determine across different photon energies (ranging from 0.01 to 10 MeV) using WinXcom computer software. For the MAC, a sharp absorption edge at 0.05 MeV is observed due to the presence of photoelectric effect. As photon energy increases, all results of the fabricated glass samples exhibit a rapid decrease for the all radiation shielding parameters determined, indicating changes in the glass systems as they tend to lose their shielding properties. Sample BTC5 which have higher density (approximately 2.176 g/cm$^3$) with higher content of $TeO_2$, was found to have the highest MAC and LAC, lowest HVL, TVL, and MFP, and the largest effective atomic number across all energy bands. As such, sample BTC5 consistently demonstrates superior shielding performance. For the observed plotted spectra of the fabricated samples, it affirms that increasing $TeO_2$ content improves the gamma shielding performance of the fabricated glass systems. This finding highlight the potential of coconut shell ash (CSA) as an eco friendly, low-cost heavy element alternative in glass composites for radiation shielding performance.

## Technical Track

Student Competition

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