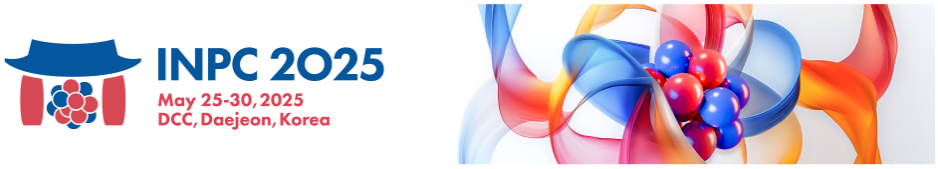

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Investigation of Neutron and Gamma Radiation Shielding of a Promising Sustainable Saudi Cement Product Utilizing Geant4 Modeling Software

Various materials have been developed for radiation protection across multiple applications. These materials must meet several criteria, including low cost and lightweight, to ensure ease of access and handling. Cement-based materials are among the effective shielding compounds due to their superior radiation attenuation properties, along with other significant advantages.
This study aims to investigate Saudi sustainable cement-based materials as shielding materials against gamma radiation and neutrons. The radiation attenuation properties of these materials will be analyzed using the Monte Carlo simulation toolkit, Geant4. The interactions of neutrons and gamma radiation with the cement-based materials will be modeled, enabling the derivation of various radiation attenuation metrics, including mass attenuation coefficients (μ_m), half-value layers (HVL), effective atomic numbers (Z_{eff}), and effective electron densities (N_{eff}) for gamma radiation. Additionally, the effective removal cross-sections (ΣR) and mean free paths (λ) for neutrons will also be examined. The results will be compared to those of commonly used cement materials.

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