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Determination of mass attenuation coefficient, effective atomic number and effective electron density for zirconium borohydrate and zirconium hydride

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The effective atomic numbers (Z_{eff}) and effective electron density (N_{eff}) of shielding materials such as borohydrate zirconium and hydride zirconium have been calculated using the mass attenuation coefficients (μ_m) obtained via WinXCOM program at the photon energy range of 1 keV-100 GeV. This work is concerned also with a calculation of macroscopic fast neutron removal cross-sections (Σ_{rem}). The main objective of this paper is evaluating the kind of shield against gamma and neutrons rays. The results show that zirconium borohydrate with low density and highest removal cross section is an excellent neutron shielding material and zirconium hydride with high density is a suitable shielding for radiation protection. Also, the attenuation of fast neutrons is more important in the first material than the second because it contains boron. Boron is unique in its ability to absorb thermal neutrons.

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