

Multi-layer structure for thermal neutron detection: CsPbBr₃ thin films coupled with ¹⁰B conversion layers

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Scintillators are versatile indirect-type detectors finding applications in many strategic fields such as nuclear medicine, imaging, high energy physics, and homeland security. Given the outstanding photophysical properties of Metal Halide Perovskite (MHPs) along with the successful application in disparate optoelectronic devices, their use as scintillator detectors is emerging with very promising advantages: low costs, fast response high quantum yield, strong absorption, scalability, flexibility and tunability of the emission wavelength. Given the effectiveness of perovskites as α particle detectors, and the potential of ¹⁰B as a neutron converter, in this paper a ¹⁰B converting layer was coupled with an all-inorganic lead halide perovskite (CsPbBr₃) layer aiming to create an high-performance thermal neutron detector for medium-high fluxes. The response of a bi-layer structure, CsPbBr₃ (1 μ m thick)/¹⁰B (1 μ m thick), deposited by laser ablation (LA) on carbon fiber, has been investigated when exposed to a ²⁵²Cf neutron source. Monte Carlo simulations have been carried out to support the experimental evidence.

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