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2D-perovskite thin films as gamma-ray detectors for medical applications

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Latest advancements in the field of ionizing radiation detection have been achieved through the application of lead halide perovskites. These organic-inorganic hybrid structures combine low-cost fabrication processes, the scalability and flexibility with desirable intrinsic properties: high stopping power, defect-tolerance, large mobility-lifetime (μτ) product, tunable bandgap and simple solution-based growth. Although promising results have been obtained through single-crystal structures, further efforts are required towards more flexible and stable devices for medical and space-related applications.
Therein we present PEA2PbBr4 thin films as active layers of high-energy, low-flux radiation detectors. Provided the fabrication procedure and techniques for interdigitated single pixels, we emphasize the main physical features to be required for dosimetry: extremely low dark current, fast response, stability over time.
Finally, specific sets of measurements are proposed that include electrical response under X- and Y-rays performed at medical facility centres with radiation sources -emitted photons from radioisotopes- employed for radiopharmaceutical therapy/nuclear medicine ((18F, 99mTc and 177Lu). Specifically, we also show its capability to follow the radioactivity path scheme at the patient skin during the intravenous drugs injection in a dummy phantom.
On the basis of these analyses, we promote PEA2PbBr4 films as the core elements for further insights, outlooks and eventual achievements towards large-area solid-state detectors for low-flux, ultra-fast x- and γ-Ray imaging and dosimetry.

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