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Perovskite solution-grown crystals directly integrated to readout interface for high spatial resolution X-ray imaging

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Hybrid lead halide perovskites are a promising candidate for a new generation of highly sensitive direct-converting detectors for medical X-ray imaging. While the usage of existing semiconductor materials such as CdTe and Si is complicated by fabrication processes and their costs, highly-crystalline hybrid lead halide perovskite active layers can be deposited on read-out array backplanes directly by solution growth. Here we present thick and uniform methylammonium lead iodide single-crystal films, solution-grown directly on hole-transporting electrode arrays. Electrodes are created on a glass substrate with patterned Indium Tin Oxide (ITO) layer, providing direct integration with the interface of external read-out electronics. Accordingly, stable MAPbI₃ X-ray detectors have been made with obtained 88% detection efficiency and 90 pGyair noise equivalent dose under 18 keV X-rays in photovoltaic mode, demonstrating high spatial resolution up to 11 lp mm⁻¹.

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