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Scalable single step perovskite deposition technique for optoelectronic device fabrication MEHEDHI HASAN, SWAMINATHAN VENKATESAN, Texas State University, JUNYOUNG KIM, University of Houston, NADER RADY, SANDEEP SOHAL, ERIC NEIER, Texas State University, YAN YAO, University of Houston, ALEX ZAKHIDOV, Texas State University — Perovskites have recently emerged as competitive semiconductor for optoelectronic devices. Perovskites are typically represented by ABX_3, obtained from the reaction between organic salt (AX) and lead salt (BX_2). Spin coated films are rough due to rapid reaction kinetics. Solution of this issue, using chemical adducts or sequential coating are shown to be effective, yet unsuitable for scalability. We report a methylammonium-acetate based one step spin coating technique, suitable for scalable device fabrication. Lead iodide (PbI_2), methylammonium-acetate (MAAc) and methylammonium-iodide (MAI) mixed in different ratios were used as starting precursors for perovskite deposition. The films derived from different ratio exhibited crystallization of perovskite phase during spinning. The technique is optimized for benchmark perovskites $CH_3NH_3PbI_3$ and $CH_3NH_3PbBr_3$ and expected to be useful for other members of perovskite family. Morphological, structural and optical study of deposited film reveal the superiority of the film synthesized using 1:1:1 ratio of PbI_2: MAAc: MAX. Further, the technique is utilized for solar cell and LED fabrication. Evidently, MAAc precursor based solar cells exhibit superior performance than reported performances of the cells used different concurrent deposition technique of perovskite with similar architecture of our devices. Likewise, LED fabricated from 1:1:1 ratio of precursors achieved 0.34% EQE which is a big jump compared with other ratios.

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