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Perovskite prepared from lead iodide deposited by sputtering

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Abstract:

Perovskites have been used in the manufacture of solar cells with efficiencies exceeding 25%. The most common perovskite, $CH_3NH_3PbI_3$, is prepared mainly by spin-coating a solution with lead iodide (PbI_2) and methylammonium iodide (MAI), either mixed (one step) or sequentially (two steps). It has already been demonstrated that highly efficient solar cells can be obtained by using PbI_2 deposited by sputtering. Here we investigated the optical and structural properties of PbI_2 deposited by rf-sputtering of a PbI_2 target at temperatures ranging from room temperature to 150 ºC and perovskite films obtained by the two step technique. Optical and structural properties of the films were investigated using UV-Vis spectroscopy, XRD, Raman, AFM and SEM spectroscopy. It was observed that the deposition temperature largely influences the optical and structural properties of the films. X-ray diffraction and SEM indicated the presence of segregated metallic lead (Pb), which was converted to perovskite by the iodination process. It was also observed that the immersion of the PbI_2 film in the MAI solution converts the segregated Pb into perovskite. The sputtering technique allows the deposition of uniform films over large areas, being compatible with roll-to-roll processes, which are desired for the production of perovskite solar panels.