Electrodeposition of perovskite films for photovoltaic application: Impact of substrate variation and electrodeposition parameters

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Hybrid organic/ inorganic perovskite solar cells have emerged substantially in the solar community[1], considered as a remarkable alternative because of its low cost and its efficiency's fascinating rise in the last ten years[2,3]. Spin coating is so far the most used technique for elaborating perovskite solar cells, though it presents many constraints such as limited surface coverage, non-homogeneity, and undefined perovskite crystallinity[4]. However, the power conversion efficiency is mainly affected by the surface quality, and to avoid all the restrictions mentioned before, electrodeposition could be used as a substitute technique[5]. Herein, electrodeposition of PbO_2 was used as a first step for elaborating $CH_3NH_3PbI_3$ perovskite layers. Then, conversion of PbO_2 films into perovskite was conducted by immersion in CH_3NH_3I solutions (Figure 1). In this work, the impact of different electrodeposition parameters on both PbO_2 and perovskite films was studied. The main interfering parameters are the applied voltage, electrodeposition time, the concentration and the pH of the electrolyte. In addition, the effect of the substrate on the deposited films was observed by conducting the study on both Glass/ITO and Glass/ITO/SnO_2 substrates.
Cyclic voltammetry, chronocoulometry, profilometry, UV-vis spectroscopy, X-Ray Diffraction and Scanning Electron Microscopy were all used to optimize the deposition parameters.

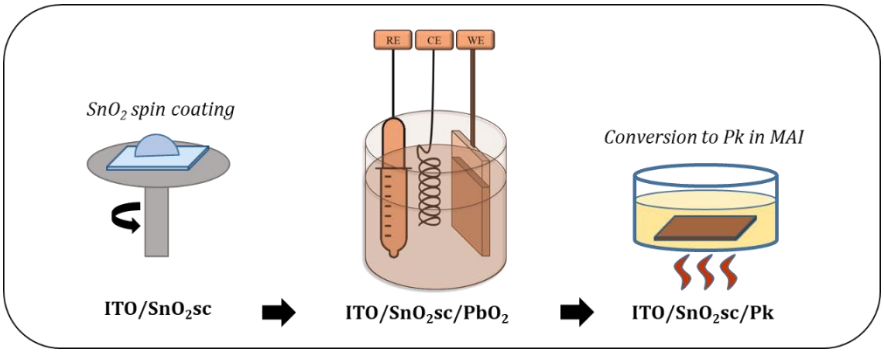

Figure 1: Steps followed to elaborate the perovskite layer presented in this work

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