Development of perovskite solar cells processed in air

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Over the last few years organic-inorganic hybrid perovskites devices have been considered as a promising photovoltaic technology thanks to their potential advantages [1].

Perovskite solar cells are commonly fabricated in nitrogen atmosphere or in air with low relative humidity due to its strong impact on the initial growth of perovskite crystals and consequently on the device performance [2]. Here, we present a method for the development of perovskite based solar cells under high relative humidity (RH> 60%) using ITO/ PEDOT: PSS / $CH_3NH_3PbI_{3-x}Cl_x$ / PCBM/ Al structure. In particular, we demonstrate that using an annealing step during the spin coating of the perovskite precursor solution we reduce the effect of humidity leading to 5.3% efficiency solar cells.

Effects of thickness and annealing temperature on the perovskite morphology were analyzed by scanning electron microscopy and atomic force microscopy and correlated to the efficiencies of perovskite solar cells.

Electrical characterization in function of time and under light illumination of the encapsulated perovskite solar cell was investigated highlighting stability.

(a) **(b)**

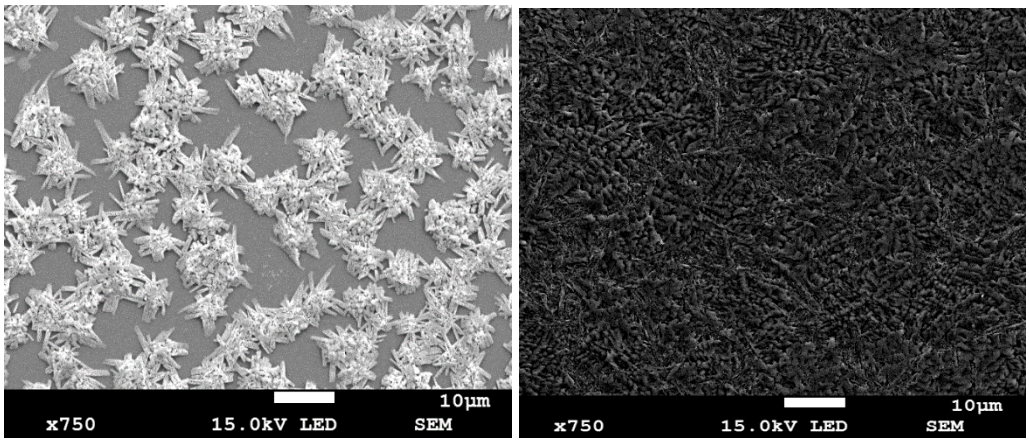

Fig.1 : SEM images showing the top-viewes of the $CH_3NH_3PbI_{3-x}Cl_x$ film (a) without annealing step during the spin coating (b) with annealing step during the spin coating.

[1] Pablo P. Boix, Kazuteru Nonomura, Nripan Mathews, *Materials Today*, 2014, 17, 16-23.
[2] Mahesh K.Gangishetty, Robert W.J.Scott, Timothy L. Kelly, *Nanoscale*, 2016,8, 6300-6307.