Chemical Passivation for Stable and Efficient Perovskite Solar Cells and Modules

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ABSTRACT: Perovskite solar cells (PSCs) have attracted major interest from academia and industry due to their high efficiency (up to 25.7%) and their compatibility with several PV applications as Si/perovskite tandem or monofacial and bifacial perovskite modules. A key step to achieve high efficiencies rely upon the control of the deposition of the perovskite film: such polycrystalline film is crystallized *in situ* starting from a precursor ink, to achieve a uniform and pin-hole free film with a low defect density. Here we will show that is possible to largely enhance the quality of the crystals by including three additives in the perovskite ink that passivate the crystalline defects, enhance the phase purity, and improve the device stability. The approach to achieving stability can follow different pathways: in this talk we will see how the perovskite composition, its passivation with additives, and the addition of compact diffusion barriers can largely extend the lifetime of PSC, making it compatible with accelerated lifetime testing used for conventional PV technologies. Finally, we will discuss the upscaling of this technology by fabricating series-connected modules. With the use of advanced laser processing is possible to structure the films with ultranarrow interconnections to fabricate minimodules with an efficiency of up to 20.7%.

KEYWORDS: novel PV, perovskite solar cells, stability, upscaling

Short BIO: **Francesco Di Giacomo** received his BSc and MSc degree in Materials Science from the Tor Vergata University (Rome). He did his Ph.D. in Electrical Engineering at the CHOSE lab (Tor Vergata) investigating the upscaling of perovskite solar cells (PSC) on flexible and rigid substrates. In 2015 he joined Solliance, working on the industrialization of PSC by sheet-to-sheet and roll-to-roll manufacturing, coordinating the activities on new materials and processes. He published more than 40 papers and filed 2 patents on these topics. In 2019 he joined the CHOSE lab as a researcher working on academic and industrial projects and becoming a lecturer in Nanoelectronics.

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