# Effect of Additives on PSCs Stability - ISOS-L1

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The emerging solar cell technology based on metal halide perovskite materials has unlocked a new potential for revolutionizing the PV field. Indeed, extensive research has been carried out on the improvement of the photovoltaic conversion efficiency by optimizing the different layers of the stack and/or the manufacturing process. Currently, the certified conversion records are set at 25.5%[1] and 29.5%[2] single junction and monolithic tandem PK/Si cells respectively. However, other characteristics must be met in order to reach the commercial level such as long-term stability. Therefore, accelerated aging is necessary to understand the PSCs behavior in operating conditions.

In this study we focused on the effect of PbSCN and KSCN additives on the stability of the perovskite cells. For this purpose, we used 0.16 cm² triple cations halide perovskite cells with additive composition ranging from 0% to 5%. A cross section schematic view of the cell is presented on Fig. 1.

Indoor accelerated aging were conducted under LED solar simulator which spectrum is composed of UV, VIS and IR. Current-voltage electrical characterizations were recorded in both direction FW-RV each 10 min while the samples are kept in maximum power point $P_{MPP}$ between I-V measurements. Environmental conditions such as temperature and relative humidity are just monitored during the aging. This experimental set-up corresponds to ISOS-L1 protocol defined in the consensus statement for perovskite solar cell reliability testing[3].

Figure 1-right present the variation of maximum $P_{MPP}$ normalized to initial value as a function of accelerated aging time for different perovskite composition. Taking the example of the baseline and the PbSCN additive, it shows rapid $P_{MPP}$ decrease (5-20%) in the first 5 hours, then continuous slower degradation until the end of the test. However, in the case of 1% KSCN additive, high degradation (70%) is observed at the beginning of the test then it stabilizes for 90 hours. By comparing the different perovskite composition, it is clearly that the 2% PbSCN present higher stability. Accelerated aging under different spectra composition will be shown.

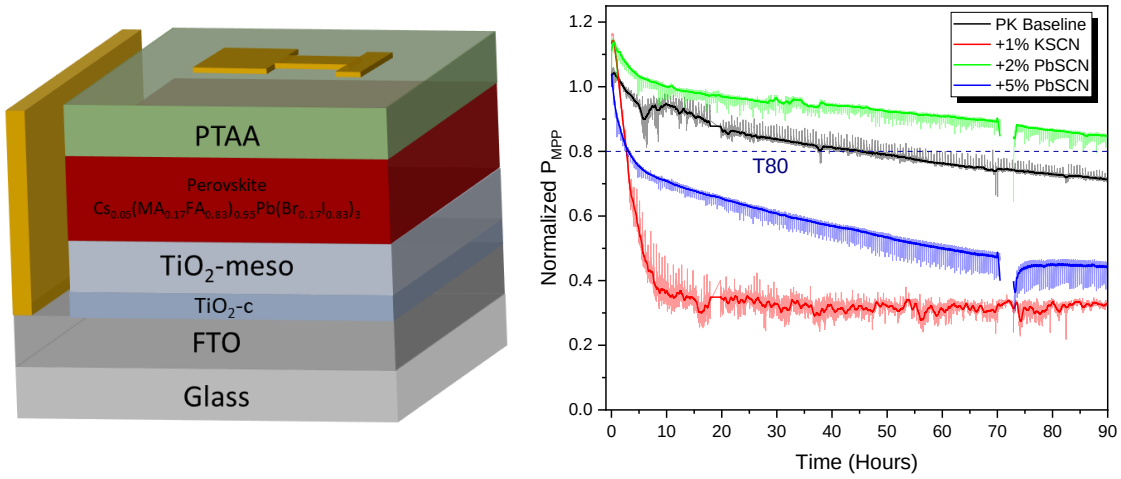


**Fig. 1** Left: Schematic representation of perovskite cells architecture used in this study. Right: Normalized $V_{MPP}$, $J_{MPP}$ and $P_{MPP}$ variation as a function of accelerated aging time.

[1] NREL. National Center for Photovoltaics, 2020. https://www.nrel. gov/pv/national-center-for-photovoltaics.html
[2] A. Al-Ashouri *et al.*, *Science*, déc. 2020, DOI: 10.1126/science.abd4016
[3] M. V. Khenkin *et al.*, *Nat. Energy*, janv. 2020, doi: 10.1038/s41560-019-0529-5