Bias-Dependent Stability of Perovskite Solar Cells: Degradation Mechanisms Reconsidered

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Sunlight concentration allows accelerated stability studies and separating the effect of light on material and cell stability from other factors. Our experimental methodology allows independent control of sunlight intensity, the sample temperature and environment during the exposure. Stress testing of perovskite solar cells (PSCs) showed that faster degradation was found for cells held at short circuit (SC) under concentrated sunlight and on the initial stage of outdoor exposure. However, cells kept at SC showed better long-term stability compared to cells kept at open circuit (OC) upon real operational conditions. We also found that (sun)light intensity was more important than illumination dose for cells degradation at SC conditions, while dose was the determining factor at OC. This indicates that different degradation mechanisms are dominant at different degradation stages and under different bias conditions, and that nano-scale understanding of degradation mechanisms is required to suggest ways to increase the device life-time.[1] Such bias-dependent degradation has been previously observed also in other types of solar cell technologies. Yet, the stability of these solar cells was greatly improved by rationale design. Bias-dependent atomic-scale degradation mechanisms in different photovoltaic technologies are compared to those of

[1] Manuscript in preparation

PSCs, towards identifying lessons that can be learned to improve PSC stability.[2]

[2] Mark V. Khenkin, Anoop K.M., Eugene A. Katz, Iris Visoly-Fisher, *Bias-Dependent Degradation of Various Solar Cells: Lessons for Stability of Perovskite Photovoltaics,* Submitted