Investigation of perovskite solar cells stability under vacuum and AM0 exposure with in situ measurements

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Abstract:

As the new space revolution unfolds, the need for cost-effective space photovoltaics is growing. In this context, alternative solar technologies, in particular, perovskites, are gaining attention since they hold promises of price competitiveness, high specific power, and compatibility with rollable/foldable solar arrays. However, strong R&D effort remains before perovskites can effectively power a space mission; for instance, better understanding of space constraints related degradation modes is of utmost importance. In that sense, while much literature is investigating perovskite solar cells' radiation hardness against various spectra of electrons and protons, far fewer are tackling the topic of vacuum impact, which remains a major constraint in this environment. In this work, we focus on four perovskite cell architectures, three bare cells and one encapsulated, and quantify their behavior against AM0/dark and air/vacuum sequences using in situ Voc monitoring. Those observations are confronted with existing literature hypotheses, and possible vacuum-related perovskite solar cell degradation mechanisms are discussed.

Conflicts of Interest

The authors have no conflicts to disclose.

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