Advanced Indoor Characterization and Degradation Analysis of Perovskite Mini-modules Using Several Optoelectronic Techniques

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Abstract

Perovskite materials have excellent prospects for semiconducting applications due to their desirable photoelectric properties. A lot of indoor and outdoor characterization testing was implemented on perovskite samples over the last few years, demonstrating the impact of several parameters on the perovskite lifetime and stability. Even, if a lot of research work has taken place with indoor and outdoor tests on perovskite devices over the last years, the application of optoelectronic and spectroscopic techniques on perovskite samples at different degradation stages is still required for perovskite mini-modules tested outdoors. In this work, advanced indoor characterization of perovskite mini-modules was implemented at different degradation stages. Several spectroscopic and optoelectronic methods such as spatially resolved Electroluminescence/Photoluminescence, Dark Lock-In Thermography, Ultrafast and Raman spectroscopies have been employed for this purpose. The evolution of hotspots, shunt resistance and defects have been detected after outdoor degradation of perovskite devices. Moreover, changes in carrier relaxation mechanisms and in structural and chemical changes were studied on samples at different stages of degradation.

Keywords

Perovskite, Degradation, Electroluminescence, Photoluminescence, Dark Lock-In Thermography, Ultrafast Spectroscopy, Raman Spectroscopy, Outdoor Testing

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