A path toward the Perovskites solar cells commercialization: Opportunities and Challenges

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Enhancing stability and efficiency are the most significant challenges facing the commercialization of Halide perovskite solar cell devices. Hybrid organic-inorganic halides are considered as outstanding materials when used as absorber layers in perovskite solar cells (PSCs) because of their efficiency, relief of fabrication, and low-cost materials. However, the moisture may originate in a dramatic degradation of the perovskite structure and some damage that degrades its optoelectronic properties.

Our work provides clear evidence of perovskite degradation mechanisms and the effect of different cations dopants in the '*formamidinium lead iodide'* and '*methylammonium lead iodide'* structural properties to improve stability. The dopant impacts the film coverage grain size and the stability of the desirable perovskite phase with fewer pinholes and large grains than undoped or pure films. The formamidinium lead iodide and methylammonium lead iodide are highly oriented along the (110) direction. Photoluminescence analyses highlight the impact of the dopant type on the surface passivation of deposited films.

In particular, I report the results of experiments following the degradation mechanisms and stability process. The analysis is extended to Mixed Halide perovskite, a more durable material for solar cells. The perovskite-based devices using cation-doped formamidinium lead iodide and methylammonium lead iodide as absorbers were more stable with higher efficiency; this strategy also allowed the development of a new, reliable production system for Perovskite Solar Cells.