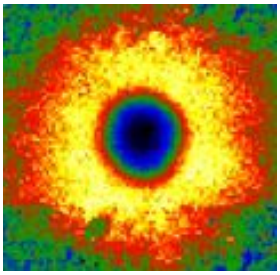

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Light-induced Degradation of MAPI Perovskite Thin Films Probed by AFM

The exceptional optoelectronic features of perovskite thin films for next-generation solar cells are drawing significant interest, but maintaining their stability over time under operating conditions remains a critical challenge. We investigated the degradation mechanisms of Methylammonium Lead Iodide (MAPI) perovskite thin films, using AFM in controlled nitrogen atmospheres. Based on prior research on light-induced degradation in ambient conditions,1,2 this study isolates the role of light under controlled nitrogen environments.

MAPI thin films exposed to a controlled nitrogen environment exhibited negligible morphological changes under AFM analysis, regardless of dark or modest light intensity. This is due to the absence of moisture and oxygen in the nitrogen environment which brings an additional contribution to degradation. Thus this approach facilitates the isolation of light-induced degradation from moisture and oxygen. We aimed to assess the degree to which the degradation caused by light alone differs in nitrogen compared to ambient conditions. Surface morphology, roughness, and any potential variations were compared across both conditions.

In conclusion, our findings suggest a potential light intensity threshold for perovskite degradation initiation under a nitrogen atmosphere. Future work will focus on quantifying the light tolerance of perovskites in nitrogen using higher light intensities. This will also support the beneficial effects of nitrogen on perovskite film stability, informing strategies for improved perovskite solar cell longevity.

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