

Temperature Dependence of Diurnal Metastability of Perovskite Solar Cells

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Outdoor stability testing under natural sunlight provides the most relevant test of solar cell stability under operational conditions [1]. Understanding perovskite-based solar cells' (PSCs') recovery properties under natural diurnal light-dark cycling can point to methods to extend its lifetime [2, 3]. We studied the effect of climate conditions on perovskite solar cell lifetime, which showed that outdoor T80 is climate dependent with the ambient temperature being a more dominant factor than the irradiance [4]. Furthermore, diurnal temperature cycles may have very different impacts on the stability and degradation of the PSCs compared to constant temperatures. Temperature cycling can affect diurnal recovery and introduce inner stress due to inter-layer differences in temperature expansion coefficients. We therefore analyzed the diurnal performance variations in our n-i-p cells – the light soaking effect during daytime followed by nighttime degradation – as a function of the ambient temperature and degree of degradation. The nighttime temperatures were found to be highly significant for the PSC lifetime and durability, and temperature control was shown to substantially improve it [5].

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