Dis-covering Self-Healing in Halide Perovskites

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There is considerable evidence that Halide Perovskites have, if prepared well, surprisingly low densities of optically and electronically active defects [1–3].

One explanation that was proposed for this, is that these are self-healing materials, i.e., if some damage that degrades their optoelectronic properties is induced by light or particle beams, the materials can return to the *status quo ante* [4], in a way that may be similar to what is known about another solar cell absorber, $CuInSe_2$ (and $Cu(In,Ga)Se_2$, CIGS) [4].

Here we report the results of our **experiments following the dynamics of defects and of degradation / curing processes *in situ***. We do so by studying the main currently used halide perovskites, varying the monovalent cations (Methylammonium, Formamidinium and Cesium) and anions (Iodide and Bromide) without interference from other materials, interfaces, surfaces or any electric/electronic effect typical of many configurations, including that of a solar cell. The time scales of the inspected phenomena vary over several orders of magnitude, are specific to each halide perovskite material and are affected by doping and composition, in addition to temperature and illumination.

All these results will be summarised, compared to and evaluated against what is known (from the literature) in order to analyse the relations between the different timescales and the proposed damaging and restoration mechanisms [5–7]. We will emphasize light-induced damage as function of light intensity, time and temperature, and explore, analyze and conclude on the possible roles of ion migration.

References

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