

Study of degradation mechanisms for inorganic halide perovskite nanocrystals

Metal halide perovskite crystal structures have emerged as an attractive class of optoelectronic materials due to their excellent optical properties. However, these nanocrystals have a much lower colloidal stability when compared to traditional semiconductor NCs, such as CdSe. Their degradation can originate from different causes: UV light irradiation, temperature, moisture, O₂, their own ionic nature that can cause chemical instability leading to ion migration and electron beam irradiation [1][2]. Fully understanding the degradation process is of the utmost importance for developing future applications for these materials. By exploiting the state-of-the-art technique of electron tomography in scanning transmission electron microscopy (STEM), we can have a three-dimensional visualization of the nanocrystals. Alongside, the combination of in-situ experiments with atomic characterization software (StatSTEM) will allow us to obtain a three-dimensional visualization of the particles under realistic conditions, such as temperature and oxygen - and thus explore to a deeper level the specific degradation mechanisms of the materials themselves [3].

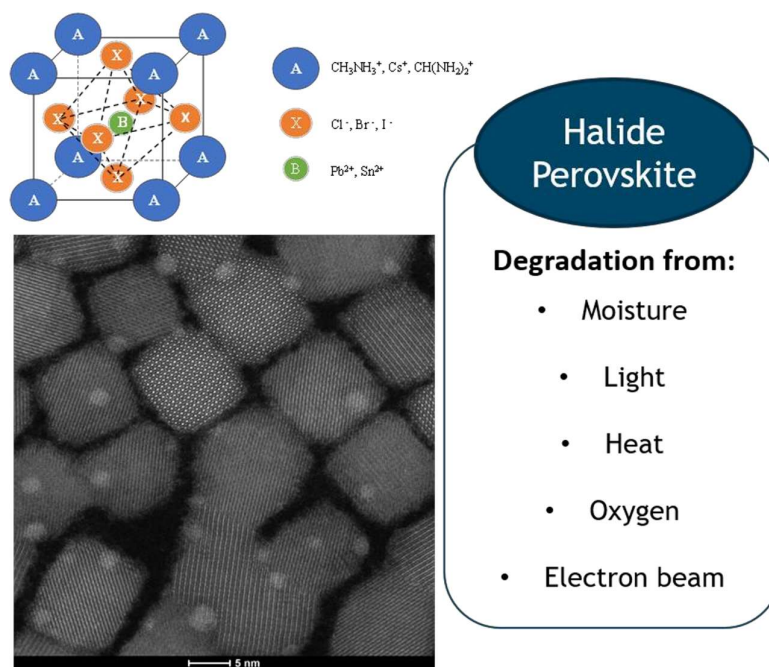


Figure 1: Halide perovskite general structure and possible degradation causes. Typical HAADF-STEM image of CsCdxPb1-xBr3 NCs with visible lead cluster formation (bright spots) caused by electron beam exposure.

References

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