Electrospray-Assisted Fabrication of Highly Stable and Efficient Perovskite Solar Cells (PV-3)

Scientific Achievement:
An aerosol-based method (electrospray deposition) is demonstrated to fabricate a stable CH$_3$NH$_3$PbI$_3$-based perovskite layer at ambient humidity (30%–50% relative humidity). Subsequently, perovskite solar cells with 0.1-cm$^2$ area and ~12% efficiency were fabricated, which retain 75% of their initial efficiency (average over various devices) for 5.5 months.

Significance and Impact:
The method developed is scalable to fabricated large-area stable perovskite solar cells.

Research Details:
- A two-step process was followed to fabricate a stable perovskite layer: PbI$_2$ was deposited using spin coating, and then CH$_3$NH$_3$I (MAI) was electrosprayed on PbI$_2$-coated substrate at room temperature (Fig. 1).
- Devices were kept at ambient conditions and tested periodically to investigate their stability (Fig. 2a).
- Key mechanism for improved stability is the precise control of the reaction between the two precursors (PbI$_2$ and MAI), which results in smooth and moisture-resistant perovskite film, compare to the spin-coating method.


Contact(s): Shalinee Kavadiya (shalinee.Kavadiya@wustl.edu); Pratim Biswas (pbiswas@wustl.edu)