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The role of polymer based epoxies in the encapsulations and long-term performance stability of next generation advanced photovoltaic devices

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Organic-Inorganic metal halide perovskite solar cells (PSCs) with efficiencies crossing over 22% with traditional geometries are the new entrants amongst next generation photovoltaic technologies. However, their expensive active materials, high lead (Pb) wastage along with their long-term performance stability have been the key challenges for their production at industrial scale. Instead of these traditional unstable devices, the carbon based printed perovskite solar cells (CPSCs) have drawn attention due to their scalable fabrication methods, abundant availability of their active materials as well as high stability in several environmental conditions. In this talk, I aim to highlight the importance of integration of polymer based epoxy coatings which can be potentially used as an effective barrier to resist the intrusion of moisture and oxygen in the active area to enhance the long-term stability of the photovoltaic performance of these CPSCs. I will present our latest results regarding very promising long-term stability (1.5 Sun UV light illumination at 40°C) and remarkable enhancements in the overall conversion efficiency for these CPSCs when they were exposed to highly humid environment. These promising findings motivate to develop the intelligent polymer coatings to serve as barrier layers according to the requirements to pass the most challenging 85% R.H and 85°C long-term stability test for the successful commercialization of this emerging photovoltaic technology.

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