

عنوان مقاله:

Study of Long-Term Stability of Perovskite Solar Cells: Highly Stable Carbon-Based Versus Unstable Gold-Based PSCs

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خلاصه مقاله:

In recent decade, Perovskite Solar Cells (PSCs) have received considerable attention compared to other photovoltaic technologies. Despite the improvement of Power Conversion Efficiency (PCE) of PSCs, the chemical instability problem is still a matter of challenge. In this study, we have fabricated two kinds of PSCs based on gold and carbon electrodes with the optimal PCE of about ۱۵ % and ۱۰.۲ %, respectively. We prepared a novel carbon electrode using carbon black nanopowder and natural graphite flaky powder for Hole Transport Material (HTM) free carbon-based PSC (C-PSC). Current density-voltage characteristics over time were measured to compare the stability of devices. Scanning Electron Microscope (SEM) and Energy-dispersive X-ray Spectroscopy (EDS) analyses were carried out to study applied materials, layer, and surface structures of the cells. The crystal structure of perovskite and its association with the stability of PSCs were analyzed using an obtained X-ray diffraction (XRD) pattern. As a result, the constructed HTM-free C-PSC demonstrated high stability against air, retaining up to ۹۰ % of its optimal efficiency after ۲۰۰۰ h in the dark under ambient conditions (relative humidity of $(\pm 5) 50$); average room temperature of ۲۵ °C) in comparison to constructed gold-based PSCs (Gold-PSC) which are not stable at times. The experimental results show that novel low-cost and low-temperature carbon electrode could represent a wider prospect of reaching better stability for PSCs in the future.

کلمات کلیدی:

Stability, Efficiency, Perovskite, Electrode, Carbon, Solar Cell

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