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Charge transfer mechanism and recombination process of hybrid perovskite solar cell

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Perovskite-based solar cells (PSC) is the rapidly emerging solar technology up to the present since its introduction in 2009, hence invigorating the photovoltaic (PV) zone. To reach the maximum potential of hybrid perovskite solar cell performance, analyses of the dominant mechanisms in a perovskite material, together with interfacial properties of contact materials and their impact on the performance and stability of the device become imperative. Understanding the interface properties of the contact materials is the primary strategy for harnessing the full potential of perovskite-based solar cells. In this study, we focused on the charge transfer process and interfacial recombination within solar cell devices with n–i–p architecture. The motivation for this paper is to investigate the impact of recombination mechanisms that exist within the interface in order to quantify their effects on the performance and stability.
To achieve our objective, we firstly provide a rationale for the photoluminescence and UV-vis measurements on perovskite thin film to allow for disentangling of different recombination pathways. Secondly, we use ideality factor measurements (I-V curve) and impedance spectroscopy to access information about recombination mechanisms in full device. Our findings suggest that charge loss in PSC is dependent mainly on the configuration of the cell and morphology of the layer, with insignificant dependence on the material preparation of the perovskite itself. This is based on result of the individual analyses of the perovskite film and device, which suggest that major recombination losses are most likely located at the interface.

Apply to be considered for a student ; award (Yes / No)?

No

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