Dye Molecules Assisted $CsPbIBr_2$ Perovskite Solar Cells for Excellent Performance

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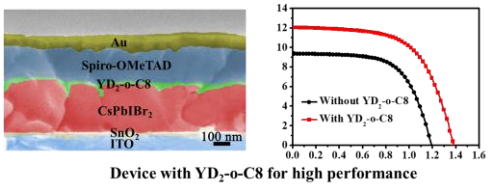
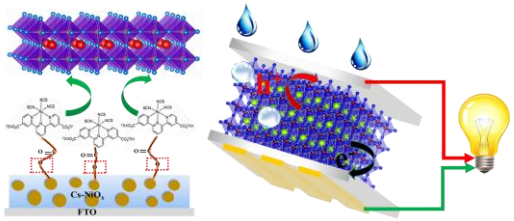
All-inorganic metal halide perovskite solar cells (PSCs) have attracted widespread attention due to excellent thermal stability. The $CsPbIBr_2$, representative all-inorganic perovskite material, has a relatively narrow bandgaps around 2.05 eV and superior thermal, which is considered the best choice due to balance the band gap and stability features.

While the low PCE and poor water stability are main issues limit $CsPbIBr_2$ development, for solving these problems we ingeniously use dye molecule to broaden the absorption spectrum and improve the moisture stability of the device. We demonstrate YD_2-o-C8 has a bifunctional effect, not only as a co-sensitization layer for $CsPbIBr_2$ with broader absorption spectrum, but also reducing the Energy loss by interface passivation. Specifically, the light absorption range of the photoactive layer was broadened from 600 to nearly 680 nm. And record-high open circuit voltage of 1.37 V and short-circuit currents of 12.05 mA/cm^2 were achieved. Meanwhile we introduced another dye moleculer N749 in device the device exhibits extremely high moisture stability that retains 90% of their initial PCE at 1000 h in ambient condition over 65 % RH. Our results prove an efficient way to prepare high-efficient and superior moisture stable all-inorganic PSCs.

The presentation will introduce the results of our group and recent progress in all inorganic $CsPbIBr_2$ PSCs.



Device with YD_2-o-C8 for high performance



Device with N749 for moisture stability

References

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2. Yang S, Wang L, Gao L, et al. ACS Applied Materials & Interfaces, 2020, 12(12): 13931-13940.