PEROVSKITE PHOTOVOLTAICS

Doping comes into play

Energy Environ. Sci. <https://doi.org/10.1039/c9ee01773a> (2019)

While well-established inorganic solar cells largely exploit doping to improve device performance, this has only been sporadically explored for perovskite photovoltaics, leaving its potential untapped. For instance, doping is effectively used to minimize charge recombination at the interface between the absorber layer and the contacts in silicon solar cells, thus limiting detrimental effects on the current/voltage characteristics. Yet perovskite devices mainly rely on surface passivation or optimization of the charge transport layers to control surface recombination. Now, Nakita Noel, Barry Rand and colleagues across the USA and UK demonstrate how to extrinsically dope the surface of a perovskite film using a molybdenum complex to reduce interfacial recombination and improve charge extraction.

Upon treating the perovskite layer with a Mo-dopant complex, the researchers observe electron transfer occurring from the perovskite to the dopant that leads to the formation of a p-type region, which remains confined at the perovskite surface. The interaction with the dopant induces band bending and an increase in the hole density at the perovskite surface that should enhance the charge selectivity of the interface and reduce the recombination events. Indeed, the device built on a dopant-treated perovskite layer shows an improved open-circuit voltage and fill factor, which the researchers associate with lower charge recombination and improved hole extraction at the p-type interface. The work demonstrates the effectiveness of interfacial molecular doping in improving interfaces in perovskite solar cells.

Giulia Tregnago

Published online: 11 October 2019
<https://doi.org/10.1038/s41560-019-0487-y>