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PEROVSKITE SOLAR CELLS

Cesium lead inorganic solar cell with efficiency beyond 18% via reduced charge recombination

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Up to now, the maximum power conversion efficiency of organic–inorganic hybrid perovskite solar cells (PSCs) has reached 25.2%, however, stability is a key issue for commercialization. Cesium-based inorganic perovskite has great potential for improving the stability of the device. However, compared to organic–inorganic hybrid perovskite PSCs, open-circuit voltage loss is still the main reason for the low power conversion efficiency of inorganic PSCs, which is closely related to charge recombination at interface of the device or in the bulk of perovskite layer.

Recently, the research team led by Prof. Jingbi You from Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China has invented a new method for reducing charge recombination for efficient inorganic perovskite solar cells. Specifically, they introduced a thin insulated layer of lithium fluoride (LiF) between the SnO_2 substrate and the $CsPbI_{3-x}Br_x$ perovskite film, which upshift the conduction band of the electron transport layer for better band alignment and also reduce the surface defects-related recombination. In addition, the authors added an appropriate amount of lead chloride ($PbCl_2$) into the $CsPbI_{3-x}Br_x$ perovskite precursor, which improves the crystallinity of inorganic perovskite layer, further inhibit recombination in the perovskite film. As a result, an inorganic $CsPbI_{3-x}Br_x$PSCs with a power conversion efficiency (PCE) as high as 18.64% was obtained. The maximum open circuit voltage (V_{OC}) can be as high as 1.25 V and the V_{OC} loss is as low as 0.52 V. More importantly, this device can keep its 94% original efficiency undercontinuous 1-Sun condition light soaking for 1000 h, which is very promising.

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