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Photoconductive noise microscopy revealing quantitative effect of localized electronic traps on the perovskite-based solar cell performance

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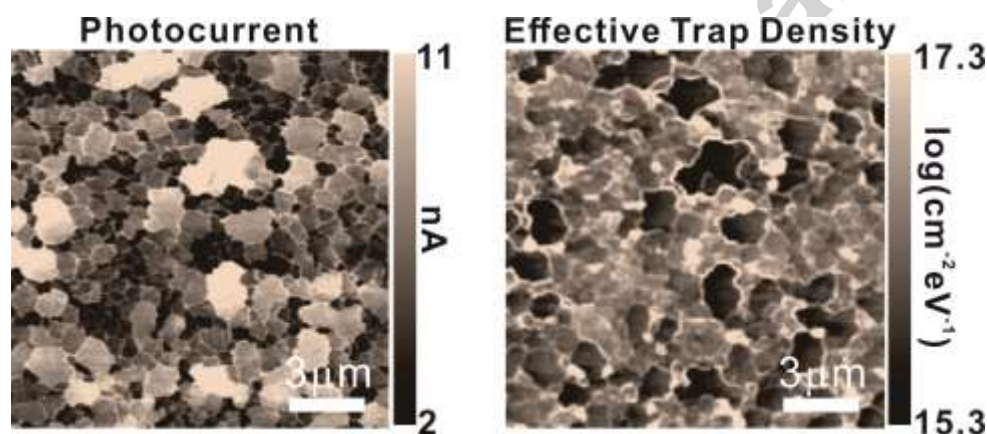
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Abstract

We developed a “photoconductive noise microscopy” method to directly image electronic charge traps distributed on a methylammonium lead iodide perovskite film in a solar cell device. The method enabled quantitative imaging of trap densities along with local photocurrents on the solar cell film. By analyzing the imaging data, we could reveal quantitative correlations between the trap distribution and local photocurrents. The results show that the spatial density of the charge traps has a power-law relationship with the short-circuit currents during a solar cell operation as well as localized photocurrents under a sample bias, indicating that a charge trap distribution in a perovskite film can be a major factor determining the performance of the perovskite-based solar cells.

Graphical abstract



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