

Abstract Submitted
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Imaging the long diffusion lengths of photo-generated carriers in mixed halide perovskite films¹ SHUHAO LIU, Department of Physics, Case Western Reserve University, LILI WANG, CLEMENS BURDA, Department of Chemistry, Case Western Reserve University, XUAN GAO, Department of Physics, Case Western Reserve University — Organometal halide perovskite has emerged as a promising photovoltaic material due to its low-cost synthesis process and outstanding performance. Though long diffusion length of photo-generated carriers plays a very important role in its success, a direct measurement of carrier diffusion lengths is still lacking. We fabricated highly crystalline $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ thin film devices on SiO_2/Si substrate with either nickel or gold as contact electrodes and parylene as encapsulation layer. By performing spatially scanned photocurrent imaging measurement with a local illumination spot, we show that photo-generated carriers in the prepared perovskite have very long diffusion lengths, with hole diffusion length $L_h = 22 \pm 7 \mu\text{m}$ and electron diffusion length $L_e = 8 \pm 4 \mu\text{m}$. Our work provides scanning photocurrent microscopy as a powerful tool to directly extract hole and electron diffusion lengths at the same time, and may be further used to elucidate the vastly different carrier diffusion lengths (on order of 100nm to $100\mu\text{m}$) in organometal halide perovskites prepared by different methods.

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