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Dynamic Tuning of Charge Transport in Organometal Halide Perovskites XI WANG, YICHUAN LING, YU-CHE CHIU, YIJUN DU, JORGE LUIS BARREDA ESPARZA, Department of Physics, Florida State University, FERNANDO PEREZ-ORIVE, BIWU MA, Department of Chemical& Biomedical Engineering, Florida State University, PENG XIONG, HANWEI GAO, Department of Physics, Florida State University — Organometal Halide Perovskite has attracted a lot of attention for their potential in a variety of optoelectronic applications. Closely related to device functionalities and viability, the unusual behaviors such as current voltage hysteresis and switchable PV effect (poling to activation devices) are of particular interest. In this work, we studied microscopically the photoelectric responses of polycrystalline methylammonium lead halide (CH3NH3PbI3) thin films. The formation of dynamic p-n junctions and dissipation kinetics are observed in our devices. The dynamically formed electric field of p-n junctions can be effectively tuned by applying various external bias voltages. The experimental results agree well with the phenomena predicted using a model based on ion migration which give indication about the explanation of the external bias-induced rectified IV curves, IV hysteresis and the switchable PV effect observed in these materials. The results will provide insights into future designation of stable optoelectronic devices and dynamic p-n junction based devices using organometal halide perovskites.

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