

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Free Charge Carriers in Lead Iodide Perovskites Revealed by Transient Absorption Spectroscopy** MINH TUAN TRINH, XIAOYANG ZHU, Columbia University — Lead iodide perovskites have emerged as the most-promising materials for low-cost thin film photovoltaics and other optoelectronic materials. Much experimental effort has been devoted to understanding fundamental properties and device performances, however the nature of photo-excitation in these materials remains debated. Using transient absorption spectroscopy, we study the dynamics of electrons and holes in photo-excited lead iodide perovskites. We show that, upon excitation with photon energy above the bandgap, hot electrons and holes are created. The e-h pair possess a transient dipole moment, which induces a transient Stark effect seen in subsequent optical transitions by the probe pulse. At high excitation densities, we find that carrier decay is well described by a third-order kinetic process, as expected from Auger recombination of free carriers. We also provide direct evidence for charge carrier traps on the surfaces and excitonic traps below the optical gaps in these materials.

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Date submitted: 14 Nov 2014

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