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**Charge transfer in rare earth oxide hybrid solar cells revealed through ultrafast spectroscopic measurement** BILL PANDIT, Department of Chemistry and Conn Center for Renewable Energy Research, University of Louisville, Louisville, KY 40292, United States, KASUN FERNANDO, BRUCE ALPHENAAR, Department of Electrical and Computer Engineering, University of Louisville, Louisville, KY 40292, United States, JINJUN LIU, Department of Chemistry and Conn Center for Renewable Energy Research, University of Louisville, Louisville, KY 40292, United States — Hybrid inorganic-organic solar cells typically combine a transition metal oxide (such as $TiO_2$) and organic dye or polymer absorber to form the donor acceptor pair. Here, Oxidized neodymium ($Nd_2O_3$) particles are combined with [6,6]-Phenyl $C_{61}$ butyric acid methyl ester (PCBM) to form the active layer of a bulk heterojunction solar cell. The addition of the $Nd_2O_3$ results in an enhancement in the short circuit current and open circuit voltage compared to pure PCBM. We also studied the ultrafast dynamics of photoexcitation in pristine PCBM film, and their blends with the rare earth oxide neodymium particles using the pump-probe photomodulation (PM) spectroscopy with ∼30 fs time resolution. Our transient PM spectrum covers spectral range of 430 nm to 730 nm. Although the spectra of $Nd_2O_3$/PCBM are very similar with pristine PCBM, the recombination kinetics of photogenerated excitons decay rate increases with the addition of $Nd_2O_3$, and ground state photobleaching is also observed. Taken together this provides evidence for the charge transfer between the organic and rare earth inorganic components. Supported by the DOE-EPSCoR fund DOE BES (DE-FG02-07ER46375) at University of Louisville.

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