Abstract Submitted
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Increasing The Work Function of NiO_x Hole Transport Layer Using Triethoxysilane-Based Monolayers[1] GANG CHEN, THOMAS BRENNER, THOMAS FURTAK, REUBEN COLLINS, CO Sch of Mines, SARAH COWAN, DANA OLSON, National Renewable Energy Laboratory — Nickel Oxide (NiO_x) is an effective hole transport layer in organic solar cells. However, the NiO_x /organic interfacial energy level alignment needs to be optimized. Unlike the commonly used O2 plasma treatment, molecular monolayer modification can provide a more stable and controlled work function change for tuning the interface by introducing dipoles that form a molecular layer. Previous work has shown the triethoxysilane (TES) chemistry bonds covalently to Zinc Oxide and can effectively tune the work function. In this study, the TES chemistry is transferred to NiO_x in order to tune the energy level alignment at the NiO_x /organic interface using three different TES modifiers. Contact angle (CA) measurements show that TES treated surfaces are much more hydrophobic than the untreated surface, which indicates the successful attachment of these molecules. Infrared spectroscopy shows that the coverage is sub-monolayer, consistent with our previous studies of other metal oxide surfaces. Kelvin probe measurements show that the TES treatment increases the NiO_x work function by as much as 450 meV compared to untreated NiO_x. Standard bulk heterojunction devices were fabricated and we find that the open circuit voltage improves with increasing work function of the TES-treated surfaces.

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Gang Chen
CO Sch of Mines

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