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Interfacial energy level adjustment for ZnO/polymer electronics using triethoxysilane-based monolayers THOMAS E. FURTAK, T.M. BRENNER, G. CHEN, R.T. COLLINS, Colorado School of Mines, D.C. OLSON, NREL — Because of its large band gap and large ionization energy, together with its relatively large mobility and benign environmental character, ZnO is being increasingly employed in hybrid organic/inorganic electronics. It is commonly necessary to tailor the interfaces in these devices to optimize performance through surface treatment of the ZnO. Traditional molecular oxide modifiers, such as thiols and organic acids, etch ZnO, making it difficult to work with very thin ZnO films or nanostructures. To avoid etching we have developed a ZnO functionalization strategy based on siloxane-based molecular layers. We used this method to create monolayers on ZnO sol-gel films having variable average dipole character by mixing two molecules with different molecular dipoles. Samples were analyzed with IR spectroscopy and Kelvin probe measurements prior to being incorporated as the cathode in bulk heterojunction photovoltaic devices. We observed continuous tuning of the work function of treated ZnO over a range of 0.5 eV that is correlated with the composition of the monolayer. The open-circuit voltage of the devices was linearly proportional to the composition, although the magnitude of the change was much smaller than the change in work function.—Sponsored by NSF through DMR-0907409.

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