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Enhanced stability of ZnO-based inverted organic photovoltaic devices by phosphonic acid modification BRADLEY MACLEOD, BERTRAND TREMOLET DE VILLERS, SARAH COWAN, Chemical & Materials Science Center, National Renewable Energy Laboratory, ERIN RATCLIFF, Department of Chemistry and Biochemistry, University of Arizona, DANA OLSON, Chemical & Materials Science Center, National Renewable Energy Laboratory — Solution-processed ZnO thin films are now commonly used as n-type bottom contacts in inverted-geometry organic photovoltaics (OPVs). The use of ZnO eliminates the need for highly-reactive top-contact (air-interface) electrode material, such as calcium and aluminum which are commonly used in conventional geometries, which enables operational lifetimes of unencapsulated devices to shift from minutes or hours to days. Modification of the ZnO film by self-assembled monolayers (SAMs) has been shown to enhance performance as well as air-stability during storage. We modify ZnO with dipolar phosphonic acids and observe enhanced performance and stability. We show for the first time devices measured under continuous illumination at one-sun intensity which have significantly enhanced stability when utilizing SAM-modified ZnO. These continuous-illumination stability measurements allow us to investigate the degradation mechanisms of these more stable inverted OPV devices. This work was was supported by of the Center for Interface Science: Solar Electric Materials (CISSEM), an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Award Number DE-SC0001084.

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