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Nickel Oxide as an Inorganic Hole Transport Layer in Organic Photovoltaics BRIAN BAILEY, University of Denver, N. EDWIN WIDJONARKO, University of Colorado, Boulder, JOSEPH J. BERRY, National Renewable Energy Laboratory, SEAN E. SHAHEEN, University of Denver, DAVID S. GINLEY, DANA C. OLSON, National Renewable Energy Laboratory — This work explores the use of nickel oxide as a hole transport layer in organic photovoltaics (OPV). The purpose of the hole transport layer (HTL) is to provide an energetic barrier to electrons at the anode of the OPV device, while facilitating extraction of holes. At present, poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT:PSS) is commonly used in this layer of the device, but it suffers from inherent problems in phase separation of the PEDOT and PSS components leading to non-uniform conductivity, incompatibility with various transparent conducting oxides due to its acidity, and high rate of water uptake that can accelerate degradation of interfaces and surrounding layers. Inorganic metal oxides such as nickel oxide present a potential solution to these problems. Using pulsed laser deposition (PLD) to deposit nickel oxide films, we show OPV device performance to be tunable by varying deposition parameters. Parameters explored include oxygen partial pressure during PLD, substrate temperature, film thickness, and post PLD surface treatments. These tune physical properties of the film such as work function and conductivity, which were measured directly, and in device performance.

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