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Screening of inorganic wide-bandgap p-type semiconductors for high performance hole transport layers in organic photovoltaic devices DAVID GINLEY, ANDRIY ZAKUTAYEV, ANDREAS GARCIA, NICODEMUS WIDJONARKO, PAUL NDIONE, AJAYA SIGDEL, PHILLIP PARILLA, DANA OLSON, JOHN PERKINS, JOSEPH BERRY, National Renewable Energy Laboratory — We will report on the development of novel inorganic hole transport layers (HTL) for organic photovoltaics (OPV). All the studied materials belong to the general class of wide-bandgap p-type oxide semiconductors. Potential candidates suitable for HTL applications include SnO, NiO, Cu2O (and related CuAlO2, CuCrO2, SrCu2O4 etc) and Co3O4 (and related ZnCo2O4, NiCo2O4, MgCo2O4 etc.). Materials have been optimized by high-throughput combinatorial approaches. The thin films were deposited by RF sputtering and pulsed laser deposition at ambient and elevated temperatures. Performance of the inorganic HTLs and that of the reference organic PEDOT:PSS HTL were compared by measuring the power conversion efficiencies and spectral responses of the P3HT/PCBM- and PCDTBT/PCBM-based OPV devices. Preliminary results indicate that Co3O4-based HTLs have performance comparable to that of our previously reported NiOs and PEDOT:PSS HTLs, leading to a power conversion efficiency of about 4 percent. The effect of composition and work function of the ternary materials on their performance in OPV devices is under investigation.

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