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Cavity Enhanced Optical Absorption in Polymer Photovoltaics
BRENT VALLE, KENNETH D. SINGER, Case Western Reserve University, JAMES ANDREWS, Youngstown State University — Simulations using transfer matrix theory have been performed demonstrating enhanced optical absorption in the cavity formed by a polymer bulk-heterojunction active layer sandwiched between an aluminum cathode and indium tin oxide (ITO) anode. Under cavity resonance conditions, it is found that the absorption of the active layer can be both spectrally tuned via frequency pulling and/or strengthened by controlling the thickness of the ITO and active layer thicknesses. A thin, polymer active layer at the first cavity resonance, occurring at a thickness of 80 nm, is attractive due its lower series resistance, shorter charge extraction length, and higher electric fields. Characterization of polymer photovoltaic devices exploiting these cavity-enhanced structures will be reported and compared with calculations.

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