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Cavity-Broadened Absorption in Organic Photovoltaics BRENT VALLE, Case Western Reserve University, STEPHEN LOSER, JONATHAN HENNEK, Northwestern University, KENNETH D. SINGER, Case Western Reserve University, JAMES ANDREWS, Youngstown State University, TOBIN MARKS, Northwestern University — One method of increasing power conversion efficiency in organic photovoltaics is to extend absorption to longer wavelengths, capturing a larger portion of the solar spectrum. In this work we use optical transfer matrix formalism to model the absorption spectra of organic photovoltaic devices. The thin Bulk Heterojunction (BHJ) layer in these devices is sandwiched by an aluminum cathode and Transparent Conducting Oxide (TCO) anode forming an optical cavity. Interference effects result in enhanced absorption for wavelengths resonant with cavity modes, and due to the large dispersion of the BHJ materials near their absorption peaks, these enhancements have interesting spectral aspects. By finely controlling the thickness of the TCO and BHJ layers absorption can be extended to longer wavelengths, absorption features can be broadened, and peak absorbance can be increased. Because these changes to the optical cavity do not require modification of the chemical structure of the photovoltaic materials, open-circuit voltage and other material-dependent device parameters remain unchanged.

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