High potential organic solar cells light the way for semitransparent photovoltaics with high efficiency

Seo-Jin Ko(sjko927@krict.re.kr)
Korea Research Institute of Chemical Technology

Abstract

Organic solar cells that are transparent to visible light are highly desirable for applications such as window treatments or solar greenhouse panels. A key challenge is to simultaneously transmit most photons between 400 and 700 nm while retaining a high short-circuit current and power conversion efficiency (PCE). Here, we report organic bulk heterojunction solar cells consisting of a donor polymer (PM2)[1] and the non-fullerene acceptor ITIC-Th that have an average visible transmittance over 40% and a PCE of 9.3%. This remarkable value for devices in this class is achieved primarily due to a very high open-circuit voltage (V_{OC}) of 0.93 V, which represents a voltage loss of only 0.50 V relative to the material band gap, E_g. When compared to similar devices made with a fullerene acceptor ($PC_{61}BM$), this voltage loss increases to 0.62 V (V_{OC} = 0.82 V).[2] We find that this difference in V_{OC} is due to a larger energy loss from non-radiative recombination in the fullerene-based solar cell, suggesting that non-fullerene acceptors may lead to better performance for future semi-transparent devices in green energy applications.

References

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Biography

Dr. Seo-Jin Ko is a senior researcher at the Korea Research Institute of Chemical Technology (KRICT). His research interests are in the area of optoelectronic materials & devices, which are related to organic solar cells (OSCs), photodetector, inorganic/organic hybrid solar cells. He currently focuses on developing of recombination dynamics, large-area coating, semi-transparent solar cell, optical modeling using organic materials.