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The role of exciton ionization processes in bulk heterojunction organic photovoltaic cells YUNLONG ZOU, RUSSELL HOLMES, Univ of Minn - Minneapolis — Dissociating photogenerated excitons into their constituent charges is essential for efficient photoconversion in organic semiconductors. Organic photovoltaics cells (OPV) widely adopt a heterojunction architecture where dissociation is facilitated by charge transfer at a donor-acceptor (D-A) interface. Interestingly, recent work on MoO_x/C_{60} Schottky OPVs has demonstrated that excitons in C_{60} may also undergo bulk-ionization to generate photocurrent, driven by the built-in field at the MoO_x/C_{60} interface. Here, we show that bulk-ionization processes also contribute to the photocurrent in bulk heterojunction (BHJ) OPVs with fullerene-rich compositions. The short-circuit current density (J_{SC}) in a MoO_x/C_{60} Schottky OPVs shows almost no dependence on temperature down to 80 K. This characteristic of bulk-ionization allows the use of temperature-dependent measurements of J_{SC} to distinguish dissociation by bulk-ionization from charge transfer at a D-A interface. For BHJ OPVs constructed using the D-A pairing of boron subphthalocyanine chloride (SubPc)-C_{60}, bulk-ionization is found to contribute >10% of the total photocurrent and >30% of the photocurrent from C_{60}. We further find that fullerene-rich SubPc-C_{60} BHJ OPVs show a larger open-circuit voltage (V_{OC}) than evenly mixed BHJs due to the presence of bulk-ionization. This talk will examine the dependence of J_{SC} and V_{OC} on the relative fraction of dissociation by charge transfer and bulk-ionization processes.

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