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Using photovoltage to measure device-relevant exciton diffusion in luminescent and non-luminescent organic semiconducting materials TYLER MULLENBACH, RUSSELL HOLMES, University of Minnesota — Exciton diffusion is a prominent component of many emerging organic optoelectronic devices and is commonly described by the exciton diffusion length (L_D). Excitons are commonly tracked by measuring their end-of-life products: photons (from radiative decay) or charge carriers (from exciton dissociation). While tracking luminescence provides an accepted means of measuring L_D for many materials, non-luminescent (dark) materials and states are inaccessible via such techniques. For dark materials, the charge carriers generated from exciton dissociation are tracked to estimate L_D (e.g., by fitting device external quantum efficiency), despite the fact that photogenerated carriers are often subject to recombination events prior to collection as current. Here, we present an alternate method of measuring L_D, equally applicable to luminescent and dark materials, that uses photovoltage instead of current to determine the number of excitons reaching the dissociating interface in an organic photovoltaic device. Use of the photovoltage sidesteps charge carrier recombination providing an unobscured measurement of L_D. The technique is verified against previous luminescence-based methods, and measurements of L_D are presented for a variety of dark materials including fullerenes.

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