

What Photons Tell About Polymer Solar Cells: Characterizations by Spectrally and Spatially-resolved Luminescence

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The detection of luminescence radiation from polymer solar cells generally allows investigation into the device physics such as the photoinduced charge transfer and the exciton dissociation rate obtained by photoluminescence quenching measurements. We have applied spectrally and spatially-resolved detection of electroluminescence radiation for the characterization of photovoltaic devices. On one hand, spectrally resolved electroluminescence provides useful information regarding the morphology and performance of the devices due to the radiative decay of charge-transfer-excitons at the donor-acceptor interface. On the other hand, the spatially-resolved electroluminescence imaging method allows local investigations on the macroscale. We detect thereby cathode failure caused by degradation processes and relate the electrodes sheet resistances with the spatial current distribution across the device.