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Nanoscale electro-optical measurements of photovoltaic materials using scanning probe microscopy NIKOLAI ZHITENEV, BEHRANG HAMADANI, PAUL HANEY, CNST, NIST, SUYONG JUNG, HUA XU, Nanocenter, UMD/ CNST, NIST — The efficiency of photovoltaic devices based on inorganic thin-films or organic polymer blends is often determined by the nanoscale structure and properties of internal and contact interfaces. Measurements of local photoconductivity, along with other scanning probe based measurements, can link the structural properties to the performance providing the desired feedback for the device optimization. However, the nature of the tip-to-sample contact can be quite different from contact interfaces in devices strongly affecting the injection and collection of charge carriers and complicating the data analysis. Here, we present the characterization of photoconductive channels in a model bulk heterojunction organic solar cell based on a p-type polymer and n-type small molecule. We directly compare the properties of the tip-to-sample interface to the nanocontact interface. We explore the nanoscale photocurrent response on two complementary device architectures using conductive tips suitable for the appropriate charge (i.e., electrons vs. holes) collection. In addition to the measurements at the top surface, we examine the response from the bulk of the film using novel sectioning technique. Our results provide significant insight into the origin of nanoscale variations in photoresponse and nanoscale morphology of such materials.

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