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Photovoltaic performance parameters at the nanoscale from in situ I-V curve measurements SADIA NASEEM, ELIZABETH TENNYSON, MARINA LEITE, University of Maryland College Park — Monocrystalline photovoltaic (PV) devices exhibit higher efficiencies than polycrystalline devices, but the high manufacturing costs associated with single crystal solar cells pose a hindrance to their wide implementation. Polycrystalline $CuIn_xGa_{(1-x)}Se_2$ (CIGS) material with high optical absorbance and low cost/Watt, is a promising alternative. Yet, the efficiency of this low-cost technology is still substantially lower than the theoretical values estimated by the Shockley-Queisser limit. This is likely due to microstructural non-uniformities, which cannot be accessed by macroscopic light I-V measurements. Therefore, we spatially resolve the electrical response of these devices by 'local' I-Vs. For that, we utilize a 100x objective as a local excitation source and LabVIEW to map the PV performance with sub-micronscale resolution through extrapolation of key parameters from pixel by pixel I-V curves. Extraction of performance parameters such as short-circuit current, opencircuit voltage fill factor, and maximum power point can provide useful information regarding optimal microstructural characteristics. This information is not only valuable for CIGS-based devices, but also will be an essential tool for maximizing performance across all PV technologies.

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