Abstract Submitted
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Nanoscale optical spectroscopy of CdTe photovoltaic devices NIKOLAI ZHITENEV, CNST/NIST, YOHAN YOON, JUNGSEOK CHAE, CNST/NIST and U. Maryland NanoCenter, AARON KATZENMEYER, CNST/NIST, HEAYOUNG YOON, CNST/NIST and U. Maryland NanoCenter, ANDREA CENTRONE, CNST/NIST — Thin film solar cells are based on polycrystalline materials such as CdTe and CIGS that are structurally and electronically non-uniform. To further advance the power conversion efficiency it is important to understand the properties of interfaces (p-n junction, contacts) and microsctructure (composition, grains) of these inhomogeneous devices. We apply two local optical techniques for spectroscopic characterization of CdTe devices. The samples are cross-sectional lamellas extracted from CdTe cell with sub-micron thickness prepared by focused ion beam. The first spectroscopic approach is based on the local light injection through a sub-wavelength aperture of optical fiber and the measurements of the transmitted / absorbed power. The optical wavelength was varied in the range from 400 nm to 900 nm. The contrast of the spatial maps of optical absorption is the strongest at excitation energies close to the band gap of CdTe and it can be associated with the composition variation throughout the device. The second technique uses the photo-thermal effect as a local measurement of absorption and can be used for broader range of wavelengths. Pulsed laser with variable wavelength is used for the excitation, and the local thermal expansion is detected by an atomic force microscope. We compare the resolution and the sensitivity of these two approaches in the range of photon energies close to the band gap where both techniques can be used.

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