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Local Structure and Electrical Performance of Pulsed Laser Deposited CdTe/CdS Thin-Film Solar Cells[1] ARYA NABIZADEH, DARREN LESINSKI, LUIS CERQUEIRA, MEHMET SAHINER, Seton Hall Univ, SAHINER-AMSCL TEAM — The photovoltaic thin films of CdS/CdTe were prepared by pulsed laser deposition (PLD) on indium tin oxide (ITO) coated glass. The local structural variations in the thin films around Cd atom upon variations in the thin film growth parameters were investigated by X-ray absorption near-edge spectroscopy (XANES) and extended X-ray absorption fine-structure spectroscopy (EXAFS) and x-ray diffraction. X-ray absorption spectroscopy measurements were performed at the National Synchrotron Light Source of Brookhaven National Laboratory. The effect of the thicknesses of the CdS and CdTe layers, laser energy and the substrate temperature on the local crystal structure and coordination around the Cd atoms were investigated through quantitative multiple scattering analysis and modeling of the x-ray absorption spectroscopy data. The induced local structural modifications upon varying synthesis conditions are correlated with the electrical performance of these photovoltaic thin-films. The quantitative multiple scattering analyses and modeling of X-ray absorption spectroscopy data revealed the local environment around the Cd atoms are highly sensitive to thin film deposition parameters and the variations of the Cd local structure influences interface quality consequently, affect the electrical performance of these photovoltaic thin films.

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