To achieve high-efficiency polycrystalline CdTe-based thin-film solar cells, the CdTe absorbers must go through a post-deposition CdCl₂ heat treatment (HT) followed by a Cu diffusion step. To better understand the roles of each treatment, CdTe solar cells with and without Cu diffusion and CdCl₂ HT are investigated using cross-sectional electron beam induced current, electron backscatter diffraction, and scanning transmission electron microscope techniques. The evolution of the cross-sectional carrier collection profiles due to these treatments that cause an increase in short circuit current and higher open-circuit voltage are identified. Also, an increased carrier collection in grain boundaries after either or both of these treatments is revealed. By use of accelerating voltage dependent EBIC measurements, the increased current at the grain boundaries is shown to be due to the presence of a space charge region with an intrinsic carrier collection profile width of ~350 nm. Each treatment improves the overall carrier collection efficiency of the cell separately, and, therefore, the benefits realized by each treatment are independent of each other.

Reference
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