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Electron Reflector to Enhance Photovoltaic Efficiency: Application to Thin-Film CdTe KUO-JUI HSIAO, Colorado State University — Numerically, electron reflector, which is a strategy to enhance the efficiency of photovoltaic devices, is applied to thin-film CdTe record-cell baseline model (efficiency = 16.5%). Simulation shows that to have the optimal effect from electron reflector, thinning cells to few microns is required. Moreover, thin cells (absorber layer below two microns) will have additional benefit from the optical reflection from the back surface. Theoretically, more than 19.5% efficiency is achievable with 0.2-eV electron reflector, 1-micron absorber layer, 10^{14} cm^{-3} hole density, and 1-ns lifetime. Moreover, 20% efficiency is possible with the consideration of 100% optical reflection. Realistic case should have the performance in the case between 20 and 100% optical reflection. This work gives thin-film CdTe cell an approach to 3% increase in efficiency.

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