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Numerical Simulation of High Efficiency All-Back-Contact Photovoltaics Using Long Lifetime Cadmium Telluride. CHRISTOPHER PYLES, MARCO NARDONE, Bowling Green State Univ — The concept of All-Back-Schottky-Contact (ABSC) thin-film photovoltaic (TFPV) devices was recently introduced as a means to reduce the cost of solar electricity while improving reliability. Rather than a typical p-n junction, electron-hole pair separation is achieved by Schottky junctions formed between the semiconductor and interdigitated, bi-metallic back contacts. This type of device minimizes the number of semiconductor layers and removes the need for extrinsic doping to build a high efficiency device. Here, we present a theoretical study of the optimal parameter set for an ABSC device that employs long-lifetime, polycrystalline cadmium telluride (CdTe) as the absorber layer. The parameter space includes relevant geometric and material properties. The Poisson equation coupled with the continuity equations for electrons and holes in an illuminated semiconductor device are solved using the finite element method (COMSOL MultiphysicsÂ®software) to simulate device performance and determine the power conversion efficiency. It is determined that >20% efficiency can be achieved for a reasonable device architecture as long as surface defects are effectively passivated. These results provide guidance for the fabrication of a prototype.

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