

CALCULATED VOLTAGE ENHANCEMENT IN CdTe SOLAR CELLS WITH BACK-ELECTRON REFLECTION

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A conduction-band barrier at the back of a CdTe absorber, which keeps the minority carriers away from the CdTe/metal interface, should act as a back electron reflector and reduce or eliminate recombination at the back contact. When an effective electron reflector is present at the back contact, therefore the voltage should be increased, because of the reduced voltage-limiting back recombination, and the lifetimes for high efficiency need not to be particularly high. A fully depleted CdTe layer (hole density of $2 \times 10^{13} \text{ cm}^{-3}$ or thin CdTe absorber with hole density of $2 \times 10^{14} \text{ cm}^{-3}$) with even a modest back electron reflector (0.2 eV) and moderate lifetime should significantly increase voltage. The electron reflector could of course be applied to CdTe that is not fully depleted, but in this case, the benefit is relatively small when the lifetime is moderate. One possible way for creating such a barrier is to add a layer of ZnTe, CdZnTe, or other material with an expanded gap in the conduction-band direction.