**Solar Cells with Bilayer CdTeSe/CdTe Absorbers**

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The highest-efficiency thin-film, polycrystalline CdTe solar cells at both the First Solar company (22.1%) and at Colorado State (19.1%) have incorporated a layer of CdTe1-xSex between the emitter and standard CdTe layer. The added layer has generally been thick enough (0.5-1.0 μm) that most of the photons contributing to the photocurrent are absorbed within it. Because of the bowing parameter for CdTe1-xSex alloys, there is a band-gap reduction of approximately 100 meV from that of CdTe over a range of x from roughly 0.2 to 0.4. The smaller band gap typically increases the cell current by about 3 mA/cm2 with little or no decrease in voltage. Hence, when other factors are unchanged, there is a 100-mV decrease in the voltage deficit and a corresponding increase in efficiency of about 2% absolute. There are various ways to form a CdTe1-xSex/CdTe structure, but it has been found important to maintain the higher-gap CdTe behind the CdTe1-xSex absorber layer, likely because it adds a back-surface field that reflects electrons away from the back contact. The features of the CdTe1-xSex layers at Colorado State include deposition by close-space sublimation in the same chamber as CdTe, low carrier density, photoluminescence intensity and lifetime significantly greater than CdTe, and the same contacting and Cl-passivation used for CdTe cells.