Cadmium Telluride (CdTe) photovoltaic (PV) cells are inexpensive to manufacture, however, they suffer from low module efficiencies due to high defect densities. Most of the recent research has been focused on the passivation of defects rather than the elimination. Sandia researchers have developed a method to eliminate these defects and improve efficiency of CdTe PV cells, potentially reducing the overall cost of these modules.

Sandia’s Enhanced Thin Film Solar utilizes a nano-patterned substrate layer between n-type and p-type semiconductor layers. The nano-islands (<90 nm) constructed in the patterned substrate promotes uniform grain growth and reduces lattice stress—resulting in fewer defects. By using graded ZnxCd(1-x)Te, the bandgap is optimized, allowing an additional avenue for increased efficiency due to localization of absorption and directed electrical fields.

The resulting thin film solar cells achieve higher uniformity, better lattice matching, reduced defects, increased current, and better contact. The improved efficiency will reduce of balance of system costs and make solar power more competitive.

**TECHNICAL BENEFITS**

- Improved efficiency (estimated at a 20% increase)
- Improved current funneling & light trapping
- Increased current
- Reduction in material defects