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Double Heterostructure Solar Cells and Photodetectors Based on MgCdTe Absorbers

Multi-layered CdTe solar cell devices have properties that are promising but face low conversion efficiencies and high manufacturing costs. In contrast to typical monocrystalline Si and GaAs materials, CdTe cells are made up of polycrystalline materials and thus, have poor open circuit voltages which are responsible for the low efficiencies. Therefore, scientists are now looking to design multilayer devices composed of various materials in order to improve the structure and properties of the finalized cell.

Researchers at ASU have developed a novel design for double heterostructure CdTe-based solar cells and photodetectors with improved performance and durable structure. The design comprises a CdTe layer sandwiched between two MgCdTe barrier layers which prevents voltage impedances and defects, permitting higher conversion efficiency. Interface passivation (a coating process to strengthen and preserve materials) allows for a broader choice of contact-layer materials which lets users customize the cell for desired electrical properties. Moreover, the design enables additional layers to be added by a lower-cost manufacturing process. In summary, scientists have improved the design of previous CdTe-based solar cells and have resulted in an improved efficiency at a lower cost of production.

Potential Applications

- Solar Energy
- Solar Cell Fabrication, Characterization, and Loss Analysis
- Defect Engineering

Benefits and Advantages

- Lower Cost – The design permits use of a cheaper manufacturing process for depositing additional necessary layers to the cell structure
- Improved Efficiency – The MgCdTe barrier layers protect the CdTe layer from impedances and defects, allowing higher conversion efficiency to be reached
- Increased Functional Range – The coating process used to protect the cell allows for a broader choice of contact-layer materials with desired properties

For more information about the inventor(s) and their research, please see:

Dr. Yong-Hang Zhang's directory webpage