Optics-2013
OMICS Group Conferences
Accelerating Scientific Discovery
International Conference and Exhibition on
Lasers, Optics & Photonics
October 7-9, 2013 Hilton San Antonio Airport, USA

Overview of II-VI based solar cells

Eric Colegrove
University of Illinois at Chicago, USA

Abstract

Different semiconductors have been tried out for the polycrystalline thin film solar cells however only II-VI materials such as CdTe/CdS true success in device performance leading to industrial production. A crucial step in the field was the introduction of CdCl2 post-deposition heat-treatment in late 1980s which was responsible for the rapid progress in performance and the industrial success. USF and NREL achieved efficiencies of 15.8% and 16.7% in 1992 and 2001 respectively. First Solar (FS) which began the production in 2003-2004 reduced the production cost below $ 0.7/Wp and became the largest PV manufacturer in short time. With the sharp drop in the Si module prices in recent years, CdTe technology needs to improve performance to be competitive. FS has achieved average module efficiency to 12.8% and need to reach beyond 16%. FS and GE reported efficiencies of 17.3% and 18.3% in 2011 and 2012 with gain in the current and FF. EPIR has achieved 15.3 % efficiency on industrial TCO on soda-lime glass. For further module efficiency gains, we need to improve the cell efficiency well beyond 20%. To achieve such efficiencies which would be closer to the true potential of CdTe, there is a strong push towards development of model systems using epitaxial CdTe to investigate fundamental device performance. UIC and Episolar are involved in projects in these areas using both MBE and CSS grown CdTe. This presentation will summarize the work in the field over past 30 years and elaborate on the future direction.

Biography

Eric Colegrove received his B.S. in Physics from Hamline University, St. Paul MN and is currently a Ph.D. candidate in the Microphysics Laboratory at the University of Illinois at Chicago under advisor Sivalingam Sivananthan. His initial research focused on optimization of thin film polycrystalline CdTe (px-CdTe) solar devices in the standard substrate configuration. His current work focusses developing a more complete understanding of px-CdTe material through the investigation of single crystal CdTe deposited by molecular beam epitaxy as a model system. In addition to his 4 years of lab experience, Eric has 2 years of industrial experience that has allowed him to develop an understanding of II-VI semiconductors especially with regard to their specific application in photovoltaics.