World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:11, No:01, 2017

Temperature Dependent Current-Voltage (I-V) Characteristics of CuO-ZnO Nanorods Based Heterojunction Solar Cells

Authors : Venkatesan Annadurai, Kannan Ethirajalu, Anu Roshini Ramakrishnan

Abstract : Copper oxide (CuO) and zinc oxide (ZnO) based coaxial (CuO-ZnO nanorods) heterojunction has been the interest of various research communities for solar cells, light emitting diodes (LEDs) and photodetectors applications. Copper oxide (CuO) is a p-type material with the band gap of 1.5 eV and it is considered to be an attractive absorber material in solar cells applications due to its high absorption coefficient and long minority carrier diffusion length. Similarly, n-type ZnO nanorods possess many attractive advantages over thin films such as, the light trapping ability and photosensitivity owing to the presence of oxygen related hole-traps at the surface. Moreover, the abundant availability, non-toxicity, and inexpensiveness of these materials make them suitable for potentially cheap, large area, and stable photovoltaic applications. However, the efficiency of the CuO-ZnO nanorods heterojunction based devices is greatly affected by interface defects which generally lead to the poor performance. In spite of having much potential, not much work has been carried out to understand the interface quality and transport mechanism involved across the CuO-ZnO nanorods heterojunction. Therefore, a detailed investigation of CuO-ZnO heterojunction is needed to understand the interface which affects its photovoltaic performance. Herein, we have fabricated the CuO-ZnO nanorods based heterojunction by simple hydrothermal and electrodeposition technique and investigated its interface quality by carrying out temperature (300 –10 K) dependent current-voltage (I-V) measurements under dark and illumination of visible light. Activation energies extracted from the temperature dependent I-V characteristics reveals that recombination and tunneling mechanism across the interfacial barrier plays a significant role in the current flow.

Keywords : heterojunction, electrical transport, nanorods, solar cells
Conference Title : ICNMS 2017 : International Conference on Nanotechnology and Materials Sciences
Conference Location : Zurich, Switzerland
Conference Dates : January 13-14, 2017