

CHARACTERIZATION OF $\text{SnS} / \text{Cd}_x\text{Zn}_{1-x}\text{S}$ THIN FILM SOLAR CELL

EDWARD OMUGA NTABO (B. Ed (Sci))

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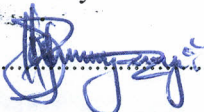
Date.....30/04/2014

DEPARTMENT OF PHYSICS

A research proposal submitted in partial fulfillment of the requirements for the award of the Degree of Masters of Science (Electronics and Instrumentation) in the School of Pure and Applied Sciences of Kenyatta University

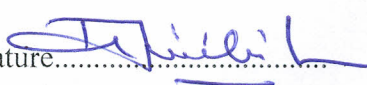
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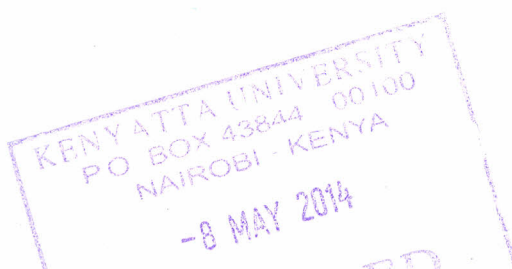
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ABSTRACT

Semiconductors of group II-VI have potential applications in many technical fields, including solar cells and photo voltaic applications. Photovoltaic cells grown on glass substrates require *p*-type absorber thin films of optimum optoelectronic properties and *n*-type wide band gap thin films. The control of the composition of $Cd_{1-x}Zn_xS$ may lead to the development of ideal materials for photovoltaic applications. Semiconducting $Cd_{1-x}Zn_xS$ materials and related ternary compounds are promising materials for high density optoelectronic applications. These applications are based on the structure of $Cd_{1-x}Zn_xS$ which exhibit fundamental absorption edges that can be varied. In solar cell systems, where CdS films have been demonstrated to be effective, the replacement of CdS with the higher band gap $Cd_{1-x}Zn_xS$ alloys has led to a decrease in window absorption loss and an increase in the short circuit current. In this research, zinc doped cadmium sulphide ($Cd_xZn_{1-x}S$) thin films will be prepared by Chemical Spray Pyrolysis (CSP) technique on glass substrates and optimized. This will be done at different Zn doping percentages in CdS. On the other hand, SnS absorber layer will also be deposited using CSP technique and optimized from aqueous solutions on glass substrates. Samples of SnS will be prepared at different ratios and substrate temperatures. The film's electrical properties (resistivity) will be measured using the four point probe to determine their resistance. Optical properties like reflectance and transmittance will be measured by UV-VIS - NIR 3700 spectrophotometer type and used to calculate other optical properties like band gap (E_g), refractive index (n), extinction coefficient (k) and absorbance (α). The results will be analyzed to determine how optical conductance, transmittance, absorbance and the electrical resistivity vary with the conditions of deposition using the Scout software. Conditions that give $Cd_{1-x}Zn_xS$ and SnS optimum optical properties will then be selected and used to fabricate a $Cd_{1-x}Zn_xS$ /SnS photovoltaic cell expected to give the highest efficiency. The photovoltaic cell's performance characteristics like short circuit current (I_{sc}), open circuit voltage (V_{oc}), fill factor (FF) and conversion efficiency (η) will be calculated from I-V curve plotted using a solar cell simulator.