EFFECT OF DEPOSITION TEMPERATURE ON THE PROPERTIES OF Al DOPED SnO_2 IN Sn_xSe_y-SnO_2:Al P-N SOLAR CELL

MUCHANGI PHILIP MUMBERE M'BURI (B.ED Sc.)

REG NO I56/CE/26172/2011

SIGN.....DATE....14/08/2014.....

DEPARTMENT OF PHYSICS

A research proposal submitted in partial fulfillment of the requirements for the award of the degree of Master of Science (Electronics and instrumentation) in School of Pure and Applied Sciences of Kenyatta University

SUPERVISORS

Dr. K. Mathew Munji. Signature.....Date..14/08/2014

Department of Physics

Kenyatta University

Dr. J.Robinson Musembi Signature.....Date.....14/08/2014

Department of Physics

University of Nairobi

August 2014

ABSTRACT

Non- renewable sources of energy have been used for a long time making the natural resources such as fuels to become depleted. This has led to the increase in demand for energy to sustain the fast growing technological world. This has triggered the need for advanced but affordable and more efficient renewable sources based on solar cell technology to be applied. In respect to this, transparent conducting oxides and certain metal layers have been applied as front and back contacts on the solar cells. The optimal optical, electrical performance and structural strength of such devices is determined by the methods of deposition and the conditions under which the deposition is carried out. In this research thin films of Aluminium doped tin oxide and tin selenide at different concentrations will be deposited on a glass substrate by reactive evaporation and evaporation respectively using Edwards 306 AUTO Evaporation system. Different ratios of tin to selenium would be used to form tin selenide whose optical and electrical properties would be studied. The Tin oxide will be deposited at various doping concentrations in the range of 1% to 10% by mass so as to improve its conductivity. The electrical properties of both tin selenide and Al doped Tin oxide thin films will be studied using the four point probe set up and readings obtained by Keithley 2400 source meter. The optical properties in the range of 300nm-1200nm will be studied using the UV-VIS-NIR spectrophotometer. Results obtained will then be analysed by scout software to determine the optical constants of the films. The ratio of Aluminium doped Tin oxide that gives the best results will be deposited at different temperatures ranging from 400°c-600°c and then electrical and optical characterization of the films will be carried out. Finally Se_xSe_y-SnO_2:Sn solar cell will be fabricated at the optimum deposition temperature using the optimum doping concentration. The performance of the p-n junction such as short circuit current (Isc), open circuit voltage (Voc), fill factor (FF) and conversion efficiency (□) will be studied using a solar cell simulator.