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نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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Ain Shams University

Faculty of Engineering

Electronics and Communications Engineering Department

Effects of Radiation on II – VI Thin Films

By

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A Thesis submitted for the award of
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STATEMENT

This dissertation "Effects of Radiation on II-VI Thin Films" is submitted to Ain Shams University for the degree of Doctor of Philosophy in Electrical Engineering-Communication.

The work include in this thesis was carried out by the author in the Communication and Electrical Engineering Department, Faculty of Engineering, Ain shams University from Jan.1995 to Oct.2000.

No part of this thesis has been submitted for a degree or a qualification at any other University or institution.

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Abstract

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The need for lightweight, rugged and reliable power source in military and space applications, where devices are subjected to a variety of radiation environments, shows the importance of studying the radiation effects on some of the bulk semiconductor devices.

The main objective of the present work is to study the gamma radiation effects on the prepared solar cells based on the II-VI materials. Also, to investigate their radiation sensitive parameters.

Physical, optical and electrical characteristics of the II-VI materials, such as CdTe, CdS, CdSe, ZnS and ZnSe, were studied. The morphology of these materials were analyzed applying the x-ray diffraction and the EDX analysis techniques. Also, the optical characteristics were measured where the optical band gap of these materials were calculated. The current-voltage relationship of these materials were measured. From which, the activation energy was obtained from the variation of the conductivity with the temperature.

CdTe was chosen, from the above compounds, to be an absorber, while CdS was chosen as a window for the proposed solar cell. Two configurations were prepared using CdS/CdTe to study some of the electrical properties of the cells. The two proposed samples were: the frontwall cell; with the arrangement of glass / CTO / CdS / CdTe, and backwall cell; with the arrangement of glass / Au / CdTe / CdS. The thermal evaporation method was the way of preparing these samples.

The dark I-V characteristics of the samples were measured to realize that hetero *pn*- junction has been obtained as a first step for preparing a solar cell. The light effects on the I-V characteristics of the samples were measured as well as the temperature effects. The photovoltaic parameters for the cells were also calculated. The variation of the open circuit voltage with temperature was measured for the different samples.

The capacitance-voltage characteristics were measured, from which the built-in voltage, depletion layer width, and interface state density were calculated.

The effect of gamma radiation on the electrical and optical characteristics of the CdS / CdTe were measured. The effect of γ-radiation on the I-V characteristics, the open circuit voltage and the short circuit current of the cell were obtained. The radiation effects on the absorption coefficients and the optical band gap were also measured.

Key words: Irradiation effects – photovoltaic – solar cells – II-VI materials.