STUDY THE EFFECT OF DIFFERENT LAYER ARRANGEMENT ON EFFICIENCY OF GALLIUM ARSENIDE SOLAR CELLS USING SILVACO TCAD TOOLS SOFTWARE

This thesis is presented in partial fulfillment for the award of the

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ABSTRACT

Photovoltaics is a renewable energy technology that converts the sunlight directly into electricity through a photovoltaic (PVs) cell, commonly called a solar cell. Basically, they are made from semiconductor material such as silicon, gallium arsenide, amorphous and many more semiconductors. Photovoltaic energy has become popular nowadays because of its ability to provide nearly permanent, uninterrupted power. What is more interesting, there is no operating cost. This research was conducted to study the effect of different layer arrangement of GaAs p/n heteroface solar cell. Three different model of GaAs p/n heteroface solar cell structure were introduced and had been simulated. ATLAS device simulator by Silvaco International was introduced for used as a tool in modeling solar cell. This project was conducted only to design and simulate both solar cell based on virtual fabrication but not involves real fabrication. This ATLAS simulator extracts the electrical characteristics of a solar cell based on virtual fabrication of its physical structure, allowing for direct manipulation of materials, dimensions and dopings. The analysis focused on spectral response analysis. From spectral response analysis, two parameters were issue, photo current and efficiency. The final result shows that, different layer arrangement can effect on photo current and efficiency.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Sun's energy is the source of nearly all energy on the earth. Humans, like all other animals and plants, rely on the sun for warmth and food. People harness the sun's energy in many other different ways. Photovoltaics is a simple and elegant method of harnessing the sun's energy. Photovoltaics devices are unique in that they directly convert the incident solar radiation into electricity, with no noise, pollution or moving parts, making them robust, reliable and long lasting[1].

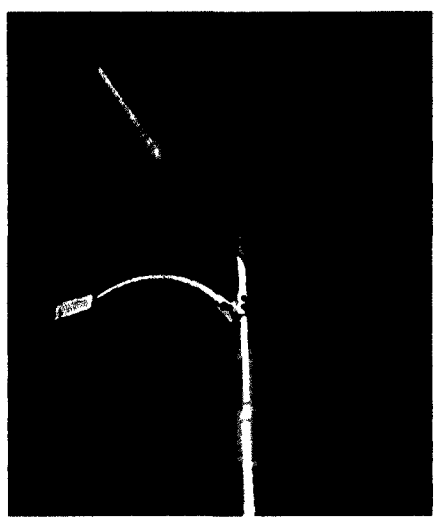

FIGURE 1.1: A solar-powered lamppost