ELECTRICAL PROPERTIES OF POROUS SILICON FOR HUMIDITY SENSOR APPLICATION

NOORHAZLEENA BINTI AZAMAN

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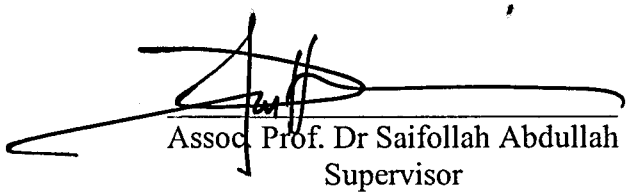
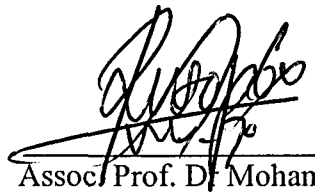
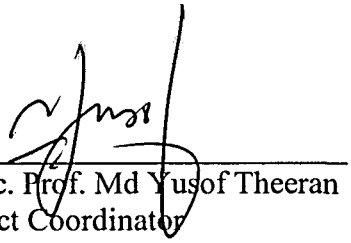
This Final Year Project Report entitled "**Electrical Properties Of Porous Silicon For Humidity Sensor Application**" was submitted by Noorhazleena binti Azaman, in partial fulfillment of the requirements of the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Sciences, and was approved by



Assoc. Prof. Dr Saifollah Abdullah
Supervisor
B. Sc. (Hons.) Physics
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor



Assoc. Prof. Dr Mohamad Rusop
Co-Supervisor
Faculty of Electrical Engineering
Universiti Teknologi MARA
40450 Shah Alam
Selangor



Assoc. Prof. Md Yusof Theeran
Project Coordinator
B. Sc. (Hons.) Physics
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Dr Muhd Zu Azhan Yahya
Head of Programme
B. Sc. (Hons.) Physics
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Date: _____

TABLE OF CONTENTS

ABSTRACT

ELECTRICAL PROPERTIES OF POROUS SILICON FOR HUMIDITY SENSOR APPLICATION

Porous silicon (PSi) is a promising material for electronics and sensors devices application. Electrical properties of porous silicon for sensor application were analyzed. The characterized on porous silicon layer by using photoluminescence (PL) and I-V measurement (I-V) has been done. Porous silicon was formed by electrochemical etching on p(100) type Si wafer substrate with the constant current density ($20mA/cm^2$) and variable the etching time. The samples ware prepared under various etching time and properties of porous silicon depend on an etching time. Porous silicon has been used in humidity sensors to detect humidity through changes of its electrical properties. The samples of porous silicon were characterized by using Photoluminescence Spectroscopy (PL) that used to characterize optical properties while I-V Measurement (I-V) used to characterize porous silicon junction properties using a linear voltage source. The result shows PL intensity is increase while the wavelength is decrease for etching time of PSi is longer. For the I-V measurement result shows the PSi samples that exposed to ethanol give low resistance which allow current easily to flow through the PSi.

CHAPTER 1

INTRODUCTION

Silicon is the chemical element that has the symbol Si and atomic number 14. A tetravalent metalloid, silicon is less reactive than its chemical analog carbon. As the eighth most common element in the universe by mass, silicon occasionally occurs as the pure free element in nature, but is more widely distributed in dusts, planetoids and planets as various forms of silicon dioxide or silicate. On earth, silicon is the second most abundant element after oxygen in the crust, making up 25.7% of the crust by mass. Silicon is a well known material in microelectronics. Microelectronics is probably the most important achievement of our time.

In general, Porous silicon (PSi) is an interconnected network of air holes (pores) in Si. PSi is classified according to the pore diameter, which can vary from a few nanometers to a few microns depending on the formation parameter. It is a promising material for electronics and sensors devices. This material exhibits attractive properties such as quantum confinement (silicon based photo-emitting devices), a large specific surface (chemical sensors) and insulating potentialities. Porous silicon is formed by electrochemical etching of single-crystal silicon substrates in concentrated hydrofluoric acid (HF) at low anodic current density. Interestingly, here the observation that the morphology of the porous silicon depends on the substrate dopant level in a very distinct way: p+-type silicon will yield mesoporous layers side consisting of larger pores (>50 nm) with numerous side branching, whereas p-type