THE STUDY OF EFFECT OF NEUTRON RADIATION TO POROUS SILICON NANOSTRUCTURES

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ABSTRACT

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Porous Silicon (PSi) was prepared by electrochemical etching method using p-type Si [100] wafer in hydrofluoric (HF) 48% electrolyte and Ethanol (C_2H_5OH) at ratio 1:1. The samples were prepared at various etching time which is at 10, 20, and 25 minutes, with a constant current density, J, 20 mA/cm^2 for each process that will give different porosity. Then, the samples were dried by using air dryer and then the luminescence will be seeing under UV light. Next, the samples were characterized by using X-Ray Diffraction (XRD), Photoluminescence Spectroscopy (PL) and Field Emission Scanning Electron Microscope (FESEM) before and after irradiated by neutron radiation. From these characterization, we can found the effected of neutron radiation on PSi nanostructure. From the result, the most sensitive sample to neutron radiation is 20 minutes etching time PSi nanostructure.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Silicon is the most common metalloid and referred to as a group IV element with semiconductor properties. It is used as a base for the manufacture of integrated circuits in the electronics industry. It is grown as a long crystal which is then sliced into wafers before being etched or treated, producing several hundred chips per wafer. It is more widely distributed in dusts, sands, planetoids and planets as various forms of silicon dioxide (silica) or silicates. It has a diamond crystal structure which refers to the particular lattice in which all atoms are of the same species. In the crystal, all of the outer electrons of all silicon atoms are used to make covalent bonds with other atoms. Such a bond is very stable, and holds the two atoms together very tightly, so that it requires a lot of energy to break this bond. There are no electrons available to move from place to place as an electrical current. Thus, a pure silicon crystal is quite a good insulator. A crystal of pure silicon is said to be an intrinsic crystal. Elemental silicon has the physical properties of metalloids with a marked metallic luster and very brittle.

Porous Silicon Nanostructures (PSN) is a form of silicon wafer which has introduced nanoporous holes in its microstructure. It has a large surface to volume ratio in the order of 500 m^2/cm^3. It is formed by electrochemical etching of silicon in hydrofluoric acid (HF) solutions. It was first discovered by Uhlir in