TEMPERATURE DEPENDENT OF PHOTOLUMINESCENCE SPECTROSCOPY ON NANOSTRUCTURED POROUS SILICON

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ABSTRACT

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Porous silicon nanostructure (PSN) has been formed by using electrochemical etching process. The samples were prepared at various etching time which are at 10, 20, 30 and 40 min that will give the different structure of porous silicon. The current density used in this research are J (60 mA/cm^2 and 120 mA/cm^2), with supply current, I_s (106.03 mA and 212.06 mA), and supply voltage, V (100mV). During the process of electrochemical etching of metallic specimen, reduction and oxidation process (redox process) will take place. Oxidation process is defined as a process in which oxygen is caused to combine with the other molecules. The samples were characterized by using FE-SEM and PL spectrometer. The FE-SEM will show the structure of porous silicon at different etching time. The PL spectrometer will measure the time independent of nanostructured porous silicon.

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Silicon is common metalloid and chemical element. The symbol is Si and it atomic number is 14.While the atomic mass is 28.0855. Silicon has many uses in the industrials. Silicon is also the major component of most semiconductor devices, most importantly integrated circuits or microchips. Silicon is generally used in semiconductors because it is remains a semiconductor at higher temperatures, its native oxide is easily mature in a furnace and forms a better semiconductor, and dielectric interface than any other material.Porous silicon was first discovered by accident in 1956 by Arthur Uhlir Jr. and Ingeborg [6]. Although the discovery of porous silicon, the scientific community was not interested in porous silicon until Leigh Canham found that the porous silicon may display quantum confinement effects at the late 1980's.He published his experiment in 1990 that silicon wafers can emit light if subjected to electrochemical and chemical dissolution [10]. Porous silicon (Psi) is form of the chemical element which has nanoporous holes in its microstructure, rendering a large surface to volume ratio in the order of $500m^2/cm^3$. Porous silicon can show a large variety of morphologies and particles sizes [5, 11].Photoluminescence spectroscopy is a contactless, nondestructive method of inquiring the electronic