THE STUDY OF SECOND STAGE OF POROUS SILICON BY CURRENT DENSITY PARAMETER

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ABSTRACT

Nowadays, there are many publications contribute with the properties and applications of porous silicon (PSi) which investigated from different aspects. From the theoretical aspect, the repeating etching process will happen at several stages. Several researchers already showed the etching at higher stage will increasing the thickness and the porosity of PSi. A series of porous silicon samples are prepared with different of parameters such as current density and etching time.

In this project, the porous silicon was prepared with different current density but the etching time was fixed. The number of sets of porous silicon was produced and characterized by photoluminescence (PL) spectrometer and Atomic Force Microscope (AFM) to identify its optical properties and morphology. In other to determined the present of PSi and the second stage of porous silicon, it was determined based on the PL intensity and the trend of peak of intensity which it returned to initial state certain value of current density. So, the porous silicon was successfully produced and the second stage of porous silicon occurred at 80 mA/cm^2.

CHAPTER 1

INTRODUCTION

1.1 Background

Porous silicon (PSi) is a semiconductor material that is form of the chemical element silicon and can be described as a silicon crystal that has a network which has an empty space in it. It introduced nanoporous holes in its microstructure. It is obtained by partial electrochemical dissolution (anodic) of Si substrates in hydrofluoric acid (HF) based solution.

Porous silicon can be classified into its pore size and porosity. The size of the structures can be divided into 3 types ranging from nanoporous silicon (including microporous and mesoporous Si) with pores and crystallites in the nanometer scale, up to macroporous silicon with pore and pillar dimensions in the micrometer scale. Compare to the pore size, porosity is a part of an empty space within the PSi layer. It can be weight to determine it. Because of PSi can be produce in many methods. One of these are anodization. During formation of porous silicon layer via this method, the porosity of a wafer can be increased through increasing current density, decreasing HF concentration and thicker the silicon layer. The range of the porosity PSi 4% macroporous layers to 95% of mesaporous layers. From the previous study of Canham in 1995, it was found that when the silicon wafer with medium to low porosity displayed more stability. So,