THE OPTICAL EFFECT OF POROUS SILICON DOPED NANO-SILVER PARTICLES

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ABSTRACT

THE OPTICAL EFFECT OF POROUS SILICON DOPED NANO-SILVER PARTICLES

Porous Silicon (PSi) has been formed by anodically etching p-type Si [100] wafer in hydrofluoric (HF) solution at 1:1 ratio of ethanol. The samples were prepared at various etching time which is at 5 minutes, 10 minutes, 15 minutes and 20 minutes, that will give different percentage of porosity. The samples undergo Photoluminescence Spectroscopy (PL) and Fourier Transform Infrared (FTIR) as a guideline for the comparison process. Then, the samples are immersed in silver-nano particles solution for 30 minutes and 2 hours to dope the Porous Silicon pores. The effects of silver-nano particles in optical properties of Porous Silicon were characterized by using Photoluminescence Spectroscopy (PL). While Fourier Transform Infrared (FTIR) is used to characterize samplesbonding and intensity.For PL result, it shows that asthe time of immersion the Porous Silicon into the nanosilver extend, the value of intensity decreasing and the wavelength is shifted. For the FTIR, the result shows the value of the high peak and the low peak of transmittance are change after the doping process. The more time of immersion spend, the higher the peak goes.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

The field of nanoscience has blossomed over the last twenty years and the need for nanotechnology will only increase as miniaturization becomes more important in areas such as computing, sensors, and biomedical applications. The development of science and technology of the nanostructured material has solution to overcome the optical properties of Porous Silicon. Nanostructured material is the structure with the structural detail that is 1/10,000 of hair thickness. The nanostructure material details smaller than the light wavelength and thus characterized by the average optical constant. The new nano-sized materials have a unique electronics and optical properties quite different from their bulk state. In particular, the optical properties of a metallic nanoparticle depend mainly on its surface Plasmon resonance, where the Plasmon refers to the collective oscillation of the free electron within the metallic nanoparticle.

Porous Silicon (PSi) is a form of the chemical element silicon which has an introduced nanoporous holes in its microstructure, rendering a large surface to volume ratio in the order of $500m^2/cm^3$. Silicon is known to be a poor emitter of light due to its indirect band gap. However with the development of Porous Silicon (Psi), whereby pores are formed within the Si substrate, the residual Si frame of the substrate may exhibit quantum