THERMALY STIMULATED CURRENT (TSC) IN POROUS SILICON

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Muhamad Shahril bin Zakaria.

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ABSTRACT

THERMALLY STIMULATED CURRENT IN POROUS SILICON

Charge trapping and detrapping within Porous Silicon (PSi) may easily occur due to numerous imperfections in its lattice. This is explained by the fact that heterogeneity at the interface between Si and PSi is the source of numerous discontinuities and imperfections in the Si crystals in addition to those existing in the porous layer. In the present work the method of TSC was applied for the calculation of activation energy of holes trap within PSi. The objective of this study is to produce porous silicon wafer and to determine its activation energy from the Thermally Stimulated Current (TSC) technique. Photoluminescence (PL) was used for the characterization of sample. Normally electrical properties measured by IV curve but in this work TSC method used to study of electrical properties. The advantages of this method are very sensitive measurement and capable to measure up to molecular level. As the PSi was temperature dependent, this research studies the temperature in the range between 80K until 300K. The difference in etching time leads to different degree of crystalline structure of PSi that has crystallographic orientation with a broad PL peak. It also leads to different activation energy obtained. Two methods were used which is TSC curve analysis and from equation. The result obtained for sample A, B, and C is 0.4 eV, 0.198 eV, and 0.19 eV for curve analysis. While the result obtained for sample A, B, and C is 0.244 eV, 0.23 eV, and 0.189 eV from the equation method.

CHAPTER 1

INTRODUCTION

1.1 Background of study

1.1.1 Nanomaterials

Nanomaterials are the field that takes a materials science-based approach to nanotechnology. It studies materials with morphological features on the nanoscale, and especially those which have special properties stemming from their nanoscale dimensions. Nanoscale is usually defined as smaller than a one tenth of a micrometer in at least one dimension, [1] though this term is sometimes also used for materials smaller than one micrometer.

1.1.2 Nanotechnology

Nanotechnology, or the use of nanomaterials are these materials can mimic surface properties (including topography, energy, etc.) of natural tissues. For these reasons, over the last decade, nanomaterials have been highlighted as promising candidates for improving traditional tissue engineering materials. Importantly, these efforts have highlighted that nanomaterials exhibit superior cytocompatible, mechanical, electrical, optical, catalytic and magnetic properties compared to conventional (or micron structured) materials. These unique properties of nanomaterials have helped to improve various tissue growth over what is achievable today [2].