QUANTUM CONFINEMENT THEORY APPLIES ON POROUS SILICON NANOSTRUCTURES

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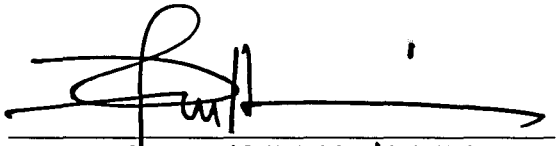

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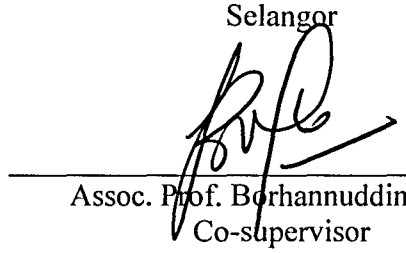

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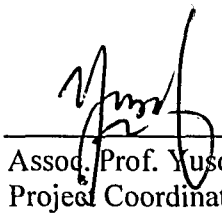

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ABSTRACT

The simulation of the Quantum Confinement phenomena in Porous Silicon nanostructures by using the open source software known as nanohub.org is used to explain the condition where Porous Silicon nanostructures is the best answer to replace the Silicon wafer in photoelectric technology. The use of Porous Silicon nanostructures in photoelectric technology is great because the Quantum Confinement theory was apply in the Porous Silicon nanostructures. The Quantum confinement fundamental theory tells that as the size of the material shrinks or decrease then the band gap expand which give interesting result when we focus on outcome to get the light emission. The simulation explain the theory behind this "beauty" effect and visualize the Quantum Confinement phenomena applies on Porous Silicon nanostructures which make the Porous Silicon nanostructures as an interesting material to be investigated. The analysis of this project consist of the wave function, energy state, optical properties, molecular structure and also the energy in each state in the potential well of the Porous Silicon nanostructures. The properties of the Porous Silicon nanostructures is actually can be identify the same as the bulk Silicon since they have the same effective mass and the element inside atom is actually the same but the size of the Porous Silicon nanostructures make the Quantum Confinement in charge the Porous Silicon nanostructures cluster make it the better material than the Silicon. All the interpretation and explanation about the Porous Silicon nanostructures with application of the Quantum Confinement effect were discuss in this project by using the simulation system.

CHAPTER 1

INTRODUCTION

1.1 Porous Silicon background

Porous silicon was unexpectedly discovered by Uhlir at Bell Laboratories in the mid 1950s. At first, he was trying to develop a means to electrochemically machine silicon wafers for use in microelectronic circuits otherwise he found that under the appropriate conditions of applied current and solution composition, the silicon did not dissolve uniformly but instead fine holes were produced, which propagated primarily in the <100> direction in the wafer.

In the 1970s and 1980s interest on Porous Silicon rise but its not widely discuss yet. porous silicon was found to be useful as a model of the crystalline silicon surface in spectroscopic studies because the high surface area in Porous Silicon. The behavior make Porous Silicon can be as a precursor to generate thick oxide layers on Si, and as a dielectric layer in capacitance-based chemical sensors.