



**STUDY THE EFFECT OF DOPING PROCESS ON THE PMOS
STRUCTURE USING SILVACO TCAD TOOLS**

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ABSTRACT

This paper presents the study on the effect of doping process on the PMOS structure using Silvaco TCAD Tools. This research done by dope the P-type material into the polysilicon to observe the electrical properties and performance of PMOS structure at constant dose concentration of 3.0×10^{11} ($/\text{cm}^3$) and temperature to 950°C using Silvaco TCAD Tools Software. By choosing the P-type materials such as Boron and Gallium, the result due to electrical performance will be appearing in the graph of I_D versus V_G and I_D versus V_D graph in Atlas Device Simulation. To study the material penetration and depletion, the graph of concentration ($/\text{cm}^3$) versus depth (μm) will be shown in Tony plot structure. Both of these results are needed to compare the suitable materials used in conducting electricity of PMOS. Dopant material doped in polysilicon will provide the advantage of a good ohmic contact with the wafer silicon and can be oxidized to form an insulating layer.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, components for integrated circuits (ICs) and central processing unit (CPU) manufacturers such as AMD and Intel are rapidly increased due to the demand of public. Currently, people started to think and realize that those modern electronics devices such as Computer, Laptop/Notebook, PDA, Mobile Phone and others devices are very important to them in order to increase their life and working condition.

The problems started to appear whenever buyers or end users are preferable to choose the modern electronics devices which provide more speed but less cost. Therefore to fulfill these requirements, the manufacturers decided to discover the new methods in order to satisfy the recently people insist. In the same time, the manufacturers have to save cost and cover any losses during the fabrication process of integrated circuits.

The main thing to improve the speed is by increasing the performance of integrated circuit in which considers the PMOS and NMOS structure. One of the method uses is by dope any dopant materials in which apply into MOSFET structure which called the doping process. By choosing the suitable dopant materials, the manufacturers can exactly define the better performance of electricity. This kind of materials need to suit the specification and performs well to meet the satisfaction to manufacturer which can save the cost and provides better facilities to the buyers or end users.