INVESTIGATION OF INSULATOR OXIDATION TYPE AND THICKNESS ON THE CAPACITOR ELECTRICAL CHARACTERISTIC

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ABSTRACT

MOS capacitors with SiO_2 and various thickness of insulator (dielectric) layer were fabricated and characterized. SiO_2 films were physical characterized by F20 Thin Film Analyzer, Four Point Probe. Capacitance-voltage measurements were utilized to obtain, the effective dielectric constant, effective oxide thickness, threshold voltage, interface quality, flatband voltage and sheet resistance. Theoretical and experimental studies on MOS capacitor built on p-type Si substrates with different SiO_2 thickness (1000 Å, 2000 Å, 3000 Å, 4000 Å), have been carried out by wet and dry oxidation. The oxide capacitance and electrical properties are determined to be a function of both the oxide thickness and at fixed gate area. Results shows that dry oxidation produce high quality of insulator layer than wet oxidation. As oxide thickness increased, threshold and flatband voltage increased linearly.

Key words: Dielectric thickness; Capacitance-Voltage measurement; Electrical properties of MOS capacitor; Oxide thickness variation; Growth by wet and dry oxidation.

CHAPTER 1

INTRODUCTION

1.1 Background

1.1.1 What is silicon?

Silicon (Si) has many uses within the field of semiconductors. Elemental silicon is the main component of most devices, most importantly integrated circuits or microchips. Silicon is widely used in semiconductors because it remains a semiconductor at higher temperatures than other materials and because its native oxide is easily grown and forms a better semiconductor/dielectric interface than almost all other material combinations.Doping Silicon with other elements adjusts its electrical response by controlling the number and charge of current carriers. Such control is necessary for transistors, solar cells, microprocessors, semiconductor detectors and other semiconductor devices which are used in electronics and other high-tech applications. (www.logitech.uk.com/silicon.asp)