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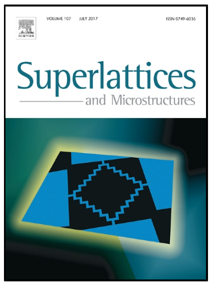

Electrical performance and photosensitive properties of Cu/SiO_2/Si –MOS based junction prepared by liquid phase epitaxy

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Electrical performance and photosensitive properties of $Cu/SiO_2/Si$ – MOS based junction prepared by liquid phase epitaxy

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Abstract

Cu/SiO_2/p-Si MOS junctions were made by the use of liquid phase epitaxy (LPE). Recognition of Crystalline structure was done by using x-ray diffraction. The results of ε', permittivity, and ε'', dielectric loss, were found to depend on bias voltage and frequency. Forward voltage and frequency decreased the series resistance.Temperature dependent current–voltage characteristics of Cu/SiO_2/p-Si MOS junctions were studied to elucidate the conduction mechanisms and extract the important parameters. The ideality factor high value was clarified according to the possibility of the existence of interfacial states and/or the influence of inhomogenety of the barrier. Series and shunt resistances (R_s, R_{sh}) showed temperature dependence.The conduction mechanism under foward biase was describedin consitent withohmic and space charge limited conductiuon depending on the the voltage range.This behaviour can be elucidated on the basis of the inhomogeneity of barrier height owing to the non-uniform junction interface[40]. The operating conduction mechanism during reverse bias was ascribed to Poole-Frenkel effect.Cu/SiO_2/p-Si MOS junctions showed photo transient characteristics when submitted to illumination of 100 mW/cm^2.

Keywords: MOS; Liquid phase epitaxy; X-ray; Permittivity; Phototransient

1. Introduction

In recent years, there has been a growing interest in the study of the electrical and dielectric behavior of metal oxides semiconductor, MOS, especially high permittivity (high-k) gate dielectric materials as SiO_2, since they have been suggested as possible candidates to diminish leakage current and increase capacitance density [1-5]. The SiO_2 appears as the best candidate for the gate oxide dielectric layer, since it has many advantages like a high permittivity [6], a wide band gap [7], high breakdown electric field [8] and thermal stability in contact with silicon substrates. To produce high quality silicon oxide on silicon substrate, a number of suggested techniques were used [9], such as thermal oxidation. Balakrishnan et