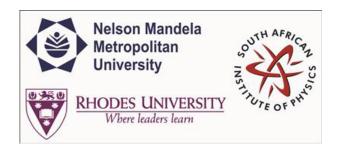
SAIP2015



Contribution ID: 115 Type: Oral Presentation

A comparison of solid state reaction, electrical performance and failure mechanism of ruthenium Schottky contacts on 6H-SiC and 4H-SiC after air annealing.

Thursday, 2 July 2015 16:30 (20 minutes)

Abstract content
 (Max 300 words)
 dref="http://events.saip.org.za/getFile.py/atarget="_blank">Formatting &
br>Formatting &
br>

Thin films of ruthenium (Ru) on 6-hexagonal silicon carbide (6H-SiC) and 4-hexagonal silicon carbide (4H-SiC) were analysed by Rutherford backscattering spectroscopy (RBS) at various annealing temperatures. Some thin film samples were also analysed by Raman spectroscopy and x-ray diffraction (XRD) technique. RBS analysis indicated ruthenium oxidation at a temperature of 400 C and commencement of diffusion of Ru into SiC at a temperature of 500 C for both Ru-4H-SiC and Ru-6H-SiC. X-ray diffraction analysis of samples annealed in air at 600 C showed evidence of formation of ruthenium silicide in both 4H and 6H-SiC but this was not corroborated by RBS analysis. Silicide formation in 4H-SiC and Ru oxidation in 6H-SiC were also confirmed by Raman analysis. The fabricated Ru-6H-SiC and Ru-4H-SiC Schottky barrier diodes (SBD) with nickel ohmic contacts showed excellent rectification behaviour and linear capacitance-voltage characteristics up to an annealing temperature of 6000C for 6H-SiC and 300 C for 4H-SiC. The Ru-6H-SiC and Ru-4H-SiC SBDs degraded after annealing at 700 oC and 400 C respectively as evidenced by the appearance of infinite series resistance. The degradation of Ru-6H-SiC is attributed to the inter-diffusion of Ru and Si at the Schottky-substrate interface, while the oxidation of Ru which led to the formation of of non-conducting and gaseous oxide compounds is the cause of Ru-4H-SiC SBDs device failure.

Apply to be
br> considered for a student
 award (Yes / No)?

yes

Level for award

- (Hons, MSc,

- PhD, N/A)?

PhD

Main supervisor (name and email)

sand his / her institution

Prof Chris Theron, chris.theron@up.ac.za University of Pretoria

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Please indicate whether
 -br>this abstract may be
 -published online
 -(Yes / No)

yes

Primary author: Mr MUNTHALI, Kinnock Vundawaka (University of Pretoria and University of Namibia)

Co-authors: Prof. THERON, Chris (University of Pretoria); Prof. AURET, Danie (University of Pretoria); Dr PRINSLOO, Linda (University of Pretoria); Dr COELHO, Sergio (UP)

Presenter: Mr MUNTHALI, Kinnock Vundawaka (University of Pretoria and University of Namibia)

Session Classification: Applied

Track Classification: Track F - Applied Physics