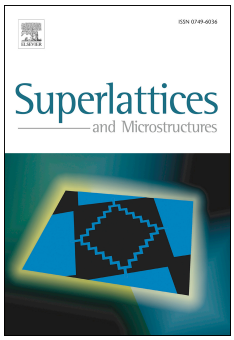

New process of silicon carbide purification intended for silicon passivation

M. Barbouche, R. Benabderrahmane Zaghouani, N.E. Benammar, V. Aglieri, M. Mosca, R. Macaluso, K. Khirouni, H. Ezzaouia

PII: S0749-6036(16)31002-3

DOI: 10.1016/j.spmi.2016.11.064

Reference: YSPMI 4699

To appear in: *Superlattices and Microstructures*

Received Date: 19 September 2016

Revised Date: 28 November 2016

Accepted Date: 28 November 2016

Please cite this article as: M. Barbouche, R.B. Zaghouani, N.E. Benammar, V. Aglieri, M. Mosca, R. Macaluso, K. Khirouni, H. Ezzaouia, New process of silicon carbide purification intended for silicon passivation, *Superlattices and Microstructures* (2017), doi: 10.1016/j.spmi.2016.11.064.

New process of silicon carbide purification intended for silicon passivation

M Barbouche[a], R Benabderrahmane Zaghouani[b], N E Benammar[c], V Aglieri[d], M Mosca[d], R Macaluso[d], K Khirouni[e], H Ezzaouia[f]

[a] *Laboratory of nanomaterials and systems for renewable energy, Research and Technologies Centre of Energy, Technopark of Borj-Cedria, BP 95 HammamLif 2050, Tunisia.*

[b]*Photovoltaic laboratory, Research and Technologies Centre of Energy, Technopark of Borj-Cedria, BP 95 HammamLif 2050, Tunisia.*

[c] *Laboratory of valuation of useful materials, national center of research in material science, Tunisia*

[d] *Thin films laboratory, Electronic computer and telecommunication engineering institute, University of study, Palerme.*

[e]*Laboratory of Physics of Materials and Nanomaterials applied to the Environment, Faculty of Gabes, University of Gabes, 6079 Gabes, Tunisia.*

[f]*Laboratory of semiconductor, nanostructure and new technologies, Research and Technologies Centre of Energy, Technopark of Borj-Cedria, BP 95 HammamLif 2050,Tunisia.*

Abstract

In this work, we report on a new, efficient and low costprocess of silicon carbide (SiC) powder purification intended to be used in photovoltaicapplications. This process consists on the preparation of porous silicon carbide layers followed by a photo-thermal annealing under oxygen atmosphere and chemical treatment. The effect of etching time on impurities removal efficiencywas studied. Inductively coupled plasma atomic emission spectrometry (ICP-AES) results showed that the best result was achieved for an etching time of 10 min followed by gettering at 900°C during 1 hour.SiC purity is improved from 3N (99.9771%) to 4N (99.9946%). Silicon carbide thin films were deposited onto silicon substrates by pulsed laser deposition technique (PLD) using purified SiC powderas target. Significant improvement of the minority carrier lifetime was obtained encouraging the use of SiC as a passivation layer for silicon.

Keywords

Silicon carbide, Impurities, Gettering, ICP-AES, Minority carrier lifetime, Passivation.

1- Introduction

Up to now, silicon is the most used semi-conductor in research and industry fields thanks to its abundance, its stability and well-established technology. Recently, Silicon carbide (SiC) has generated much interest as a promising material for high-power, high-temperature, high-frequency electronic, optoelectronic devices and engineering applications [1-3] particularly thanks to its wide band gap, its mechanical strength, its thermal stability, its high saturation electron drift velocity and its ability to operate at high temperatures. During last years, important efforts have been dedicated to the use of silicon carbide in photovoltaic applications. Many