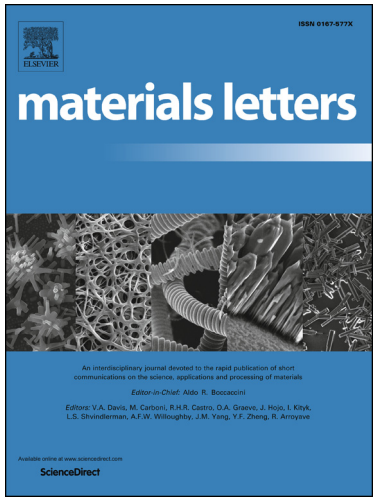

Growth of high-quality AlGaN epitaxial films on Si substrates

Yuan Li, Wenliang Wang, Yunhao Lin, Xiaochan Li, Liegen Huang, Yulin Zheng, Zichen Zhang, Guoqiang Li

PII: S0167-577X(17)31101-1
DOI: http://dx.doi.org/10.1016/j.matlet.2017.07.065
Reference: MLBLUE 22907

To appear in: *Materials Letters*

Received Date: 17 June 2017
Revised Date: 11 July 2017
Accepted Date: 12 July 2017

Please cite this article as: Y. Li, W. Wang, Y. Lin, X. Li, L. Huang, Y. Zheng, Z. Zhang, G. Li, Growth of high-quality AlGaN epitaxial films on Si substrates, *Materials Letters* (2017), doi: http://dx.doi.org/10.1016/j.matlet.2017.07.065

Growth of high-quality AlGaN epitaxial films on Si substrates

Yuan Li,[a, b] Wenliang Wang,[a, b, c, *] Yunhao Lin,[a, b] Xiaochan Li,[a, b] Liegen Huang,[a, b] Yulin Zheng,[a, b] Zichen Zhang,[a, b] and Guoqiang Li,[a, b, c, *]

[a] State Key Laboratory of Luminescent Materials and Devices, South China University of Technology, Guangzhou 510640, China

[b] Department of Electronic Materials, School of Materials Science and Engineering, South China University of Technology, Guangzhou 510640, China

[c] Engineering Research Center on Solid-State Lighting and its Informationisation of Guangdong Province, Guangzhou 510640, China

[*]Corresponding author, E-mail: wenliangwang@scut.edu.cn and msgli@scut.edu.cn, Tel.: 0086 20 87112957 and Fax: 0086 20 87112957

Abstract: High-quality AlGaN epitaxial films have been grown on Si(111) substrates by metal-organic chemical vapor deposition through introducing an AlN layer followed by a high Al composition AlGaN buffer layer, together with optimizing the growth temperature to promote the dislocations reduction. The as-grown ~400 nm-thick AlGaN epitaxial films with optimized growth temperature of 980 °C reveal high crystalline quality with a full-width at half-maximum for AlGaN(0002) of 0.29° and smooth surface with a root-mean-square surface roughness of 0.76 nm. This work provides an effective approach for the growth of high-quality AlGaN epitaxial films in the application of ultraviolet lasers and detectors.

Keywords: epitaxial growth; morphology; X-ray technique; hetero-interface

1. Introduction

Recently, group-III nitrides have received much attention because of their superior properties, such as direct band gap, high electron mobility, high thermal conductivity, *etc* [1-3]. Among them, AlGaN is one of the most promising group-III nitrides to fabricate laser diodes, ultraviolet detectors, gas sensitive sensors, *etc* [4]. To grow