A6

EFFECT OF NUCLEATION TIME WITH TMAl PREFLOW ASSISTANCE ON REDUCING DISLOCATION DENSITY OF AlN LAYER FOR AlGaN-BASED UVC LED

M.E.A. Samsudin[1,*], Y.Yusuf[1], C. Zollner[3], M. Iza[2], J.S.Speck[2], S.P. Denbaars[2,3], S. Nakamura[2], N. Zainal[1]

[1]*Institute of Nano Optoelectronics Research and Tecnology (INOR), Universiti Sains Malaysia, 11800 USM, Penang, MALAYSIA.*
[2]*Department of Electrical and Computer Engineering, University of California Santa Barbara, CA 93106, USA.*
[3]*Materials Department, University of California Santa Barbara, CA 93106, USA.*

[*]*Corresponding Author: measamsudin@student.usm.my*

ABSTRACT- AlGaN-based UVC LEDs have now received numerous attentions due to their ability to eliminate coronaviruses which cause COVID-19 disease. It is therefore essential to improve the efficiency of the LEDs to make them compatible for large scale applications. One of the major challenges to improve the efficiency is to reduce the dislocation density in AlN layer; the base layer for the LEDs, to be below 10^9 cm^{-2}. Thus far, many works have been proposed to reduce the dislocation in the AlN layer. However, by properly adjusting the AlN nucleation time in the growth of the AlN layer, the dislocation can be reduced. The effect might be more significant with TMAl preflow assistance, which is applied *after* the growth of the nucleation. In this work, we will present the effect of the nucleation time with the assistance of TMAl preflow on reducing the dislocation density in the overgrown AlN layer. With 60 seconds of nucleation, the density of the dislocation in the AlN layer can be as low as 9.0 x 10^8 cm^{-2}. In addition the role of the TMAl preflow assistance will be justified. The AlN layer was subsequently used to grow a 255 nm UVC LED. The diode characteristic and CL emission of the LED will be discussed towards the end of the presentation.

Keywords: AlN layer, Nucleation time, TMAl preflow, Dislocations density, UVC LED, Metalorganic chemical vapor deposition.