Supporting information

The Influences of AlGaN barrier epitaxy in multiple quantum wells on the optoelectrical properties of AlGaN-based deep ultra-violet light-emitting diodes

Tien-Yu Wang[1], Wei-Chih Lai*[1,2], Qiao-Ju Xie[1], Shun-Hao Yang[1], Sheng-Po Chang[1,2,3], Cheng-Huang Kuo[4], and Jinn-Kong Sheu[1,2]

[1]Department of Photonics, National Cheng Kung University, Tainan 70101, Taiwan

[2]Advanced Optoelectronic Technology Center, Research Center for Energy Technology and Strategy, National Cheng Kung University, Tainan 70101, Taiwan

[3]Institute of Microelectronics and Department of Electrical Engineering, National Cheng Kung University, Tainan 70101, Taiwan

[4]Institute of Lighting and Energy Photonics, College of Photonics, National Yang Ming Chiao Tung University, Tainan 71150, Taiwan

*weilai@ncku.edu.tw

(a)

p-GaN	10 nm
p-AlGaN (graded Al)	20 nm
p-AlGaN superlattice	20 nm
EBL	40 nm
MQWs	5 pairs
n-$Al_{0.6}Ga_{0.4}N$	1.5 μm
Transition layers	0.6 μm
AlN	3 μm
Sapphire	

(b)

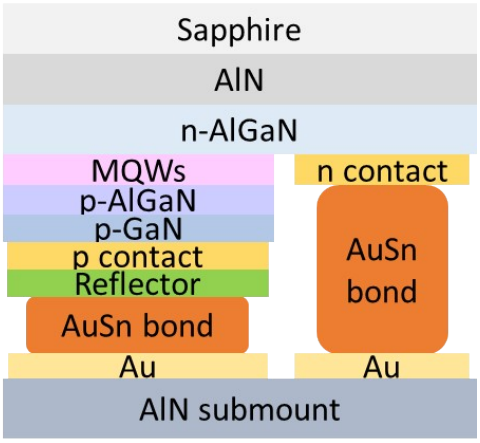

Fig. S1 (a) The epitaxial structure of the AlGaN-based DUV LEDs. (b) The schematic of the fabricated flip-chip DUV LED.

The polarization-dependent EL spectra were measured for the DUV LEDs varying the AlGaN barrier growth rate. With lowering the AlGaN barrier growth rate, the TE-polarized EL intensity increased. Accordingly, the DOP in the DUV LEDs increased as the AlGaN barrier growth rate was reduced.

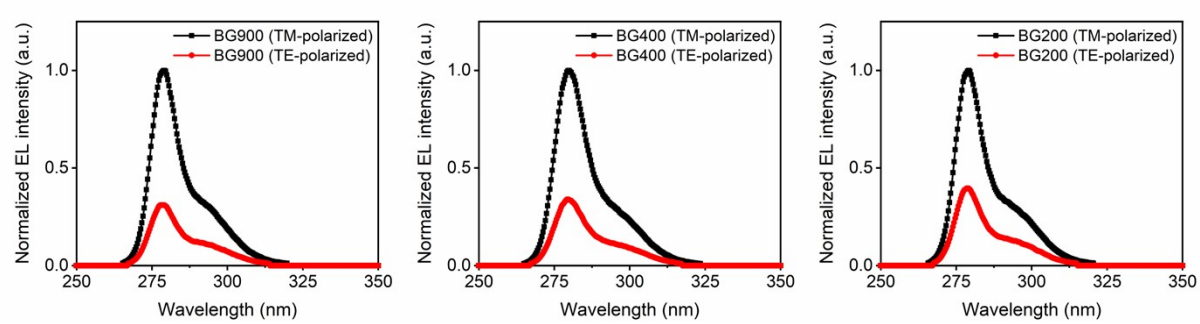

Fig. S2 Polarization-dependent EL spectra of the DUV LEDs varying AlGaN barrier growth rate.

$Al_{0.7}Ga_{0.3}N$ barrier	400 nm
n-$Al_{0.6}Ga_{0.4}N$	1.5 μm
Transition layers	0.6 μm
AlN	3 μm
Sapphire	

Fig. S3 The epitaxial structure of the AlGaN barrier layer for the measurement of AlN (104) X-ray diffraction reciprocal space mapping.