Supplementary Information (SI) for Journal of Materials Chemistry C.

Supplementary Material

Electrochemical epitaxial lift-off and transfer of InGaN/GaN heterostructure film for vertical Micro-LED array

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Diagram description

Figure S1. Schematic diagram of the epi-structure on sapphire.

Figure S2. The log-scale bias I–V characteristic curve of the single Micro-LED.

Figure S3. Chromatographic separation of H_2, O_2 and N_2 on log scale.

Figure S4. PL Spectra of Micro-LEDs at 5K and 300K without EELO.

Figure S5. PL spectra of Micro-LEDs prepared by EELO in 0.3 mol/L nitric acid electrolyte at 5K and 300K.

Figure S6. PL spectra of Micro-LEDs prepared by EELO in 0.3 mol/L oxalic acid electrolyte at 5K and 300K.

Table S1. Comparison of the results of Raman spectroscopy of GaN after EC etching with published data.

Table S2. Comparison of the results of Raman spectroscopy of Ga_2O_3 after EC etching with published data.

Table S3. Comparison of the results of Raman spectroscopy of GaOOH after EC etching with published data.

Table S4-S6: XPS peak position, fwhm (full width half maximum) and peak area of GaN epitaxial wafer after EELO. **Table S4** denotes all peaks in the Ga 3d region, **Table S5** denotes all peaks in the O 1s region, and **Table S6** denotes all peaks in the C 1s region.

Figure S1

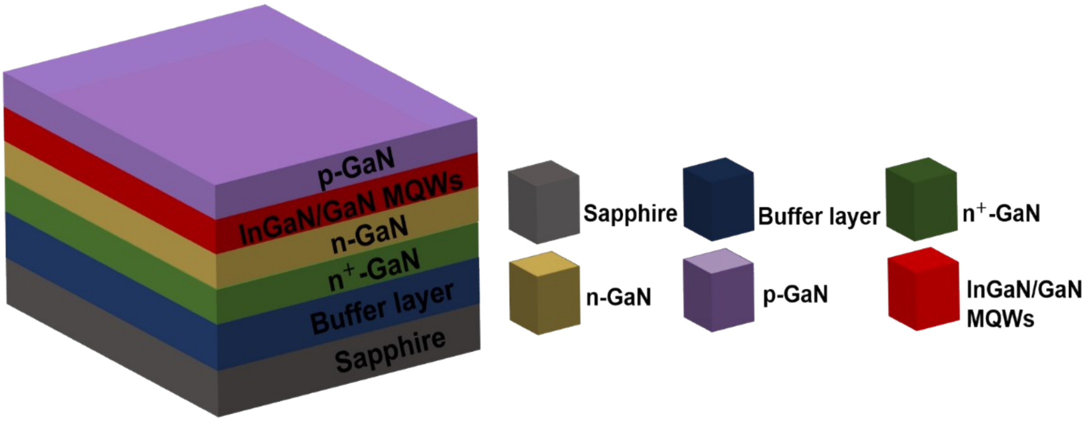

Figure S1. Schematic diagram of the epi-structure on sapphire.

Figure S2

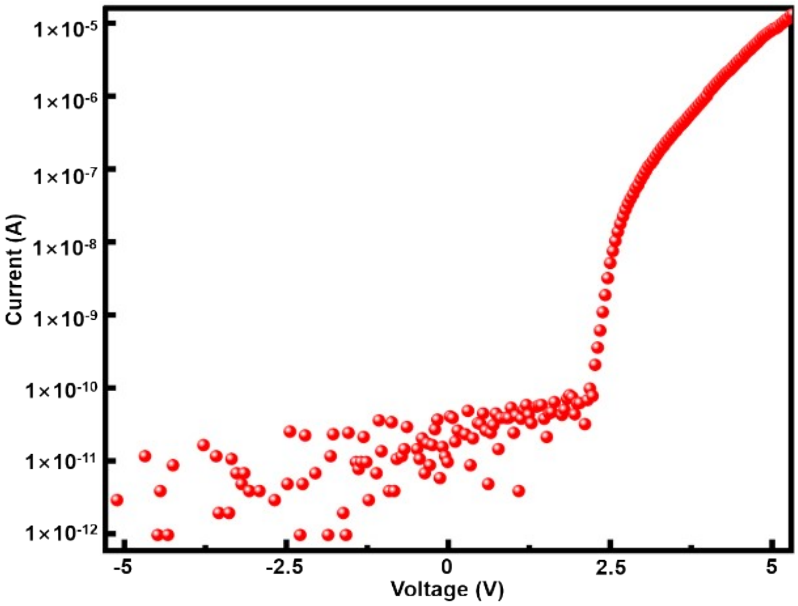

Figure S2. The log-scale bias I–V characteristic curve of the single Micro-LED.

Figure S3

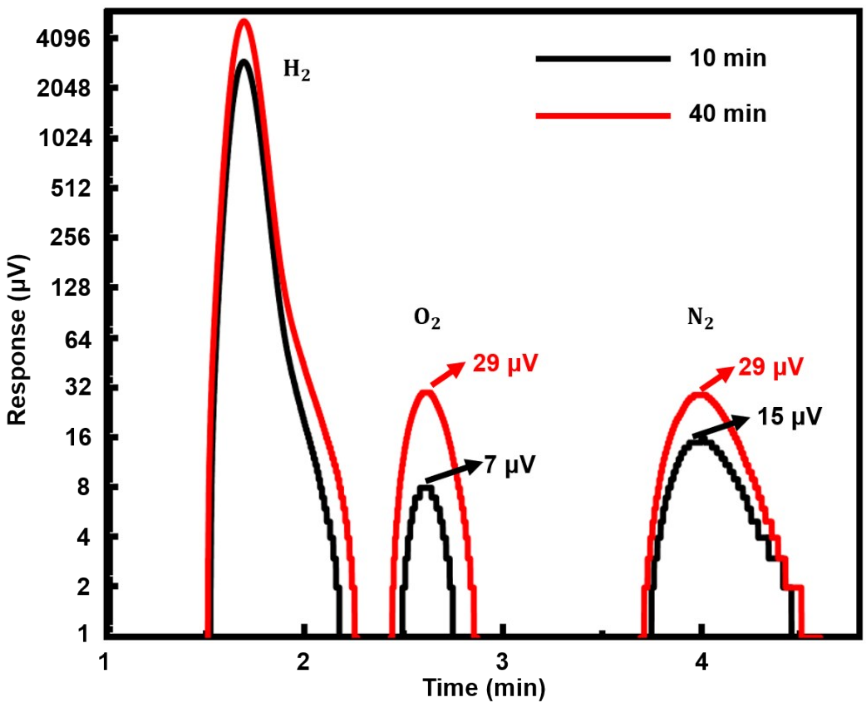

Figure S3. Chromatographic separation of H_2, O_2 and N_2 on log scale.

Figure S4

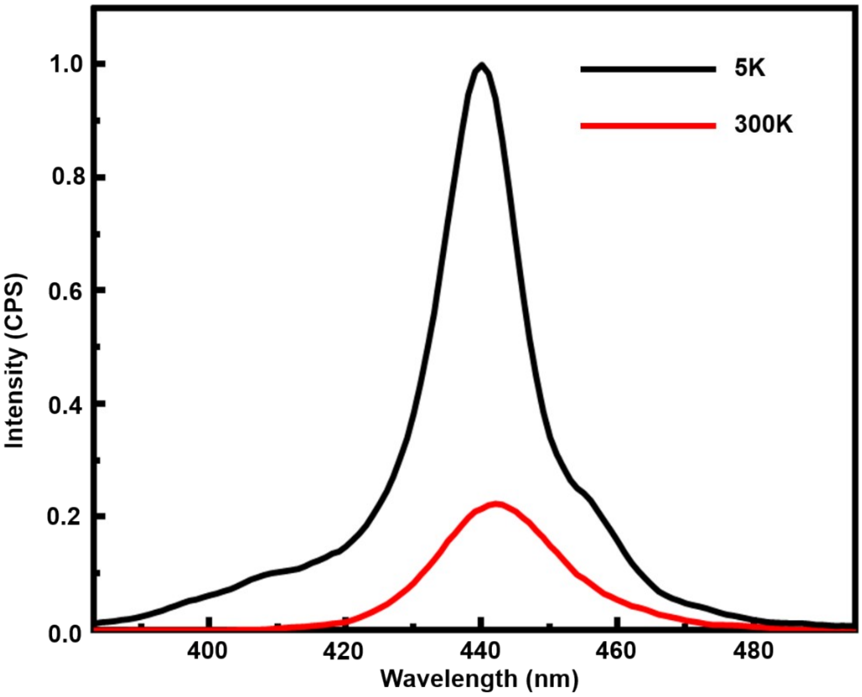

Figure S4. PL Spectra of Micro-LEDs at 5K and 300K without EELO.

Figure S5

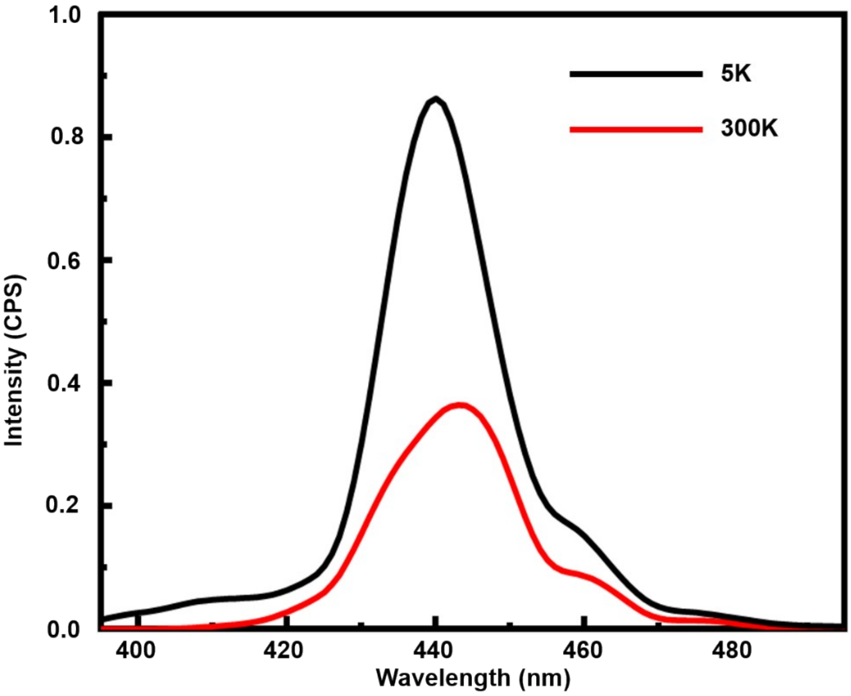

Figure S5. PL spectra of Micro-LEDs prepared by EELO in 0.3 mol/L nitric acid electrolyte at 5K and 300K.

Figure S6

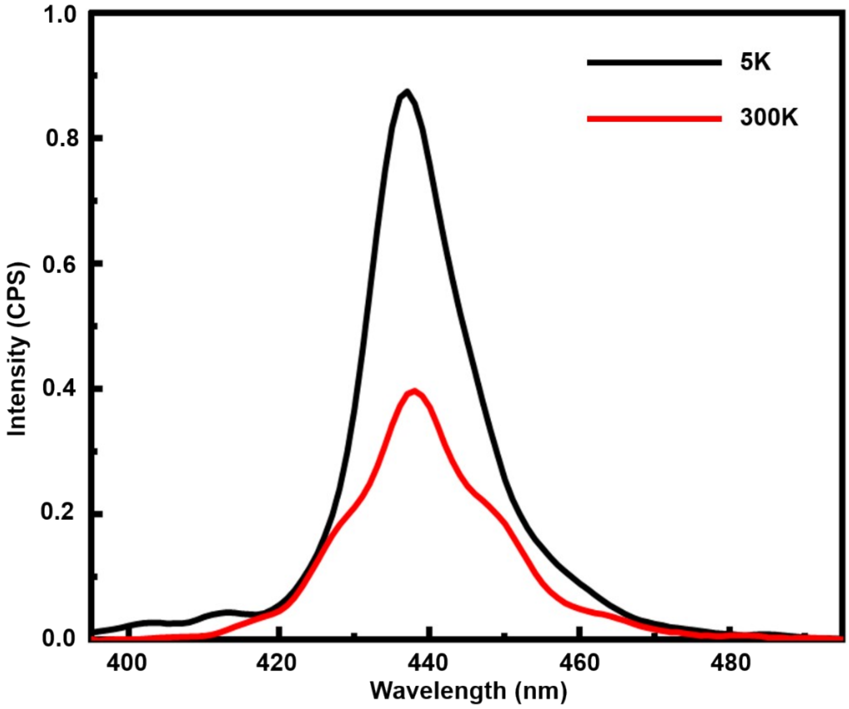

Figure S6. PL spectra of Micro-LEDs prepared by EELO in 0.3 mol/L oxalic acid electrolyte at 5K and 300K.

Table S1: Comparison of the results of Raman spectroscopy of GaN after EC etching with published data.

This work	[1]	[2]
142	144	-
411, 416	-	417
568	569,567	567.6-569

Table S2: Comparison of the results of Raman spectroscopy of Ga_2O_3 after EC etching with published data.

This work	[3]	[4]

155	-	152
480	475	475
624	629	624
232	230	225

Table S3: Comparison of the results of Raman spectroscopy of GaOOH after EC etching with published data.

This work	[5]
273	273
480	474
624	628

Table S4-S6: XPS peak position, fwhm (full width half maximum) and peak area of GaN epitaxial wafer after EELO. Table S1 denotes all peaks in the Ga 3d region, Table S2 denotes all peaks in the O 1s region, and Table S3 denotes all peaks in the C 1s region.

Table S4

Ga 3d	Ga-N	Ga(OH)3 or Ga2O3
Area CPS. eV	51927	37381
Fwhm (eV)	0.98	1.26
Position (eV)	19.9	20.4

Table S5

O 1s	Ga-OH or Ga-O	O(H_2O)
Area CPS. eV	65626	4535
Fwhm (eV)	1.84	1.83
Position (eV)	531.8	533.1

Table S6

C 1s	C=O	C-O/C-N	C-C/C=N
Area CPS. eV	51927	37381	62917
Fwhm (eV)	0.98	1.26	1.41
Position (eV)	19.9	20.4	284.8

References:

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