

# Polarity Control and Nanoscale Optical Characterization of AlGaIn-based Multiple Quantum Wells for Ultraviolet C emitters

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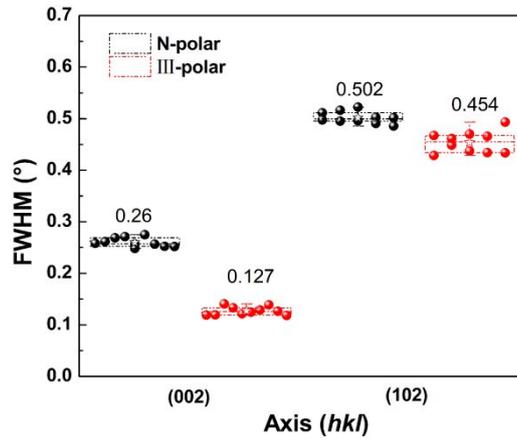
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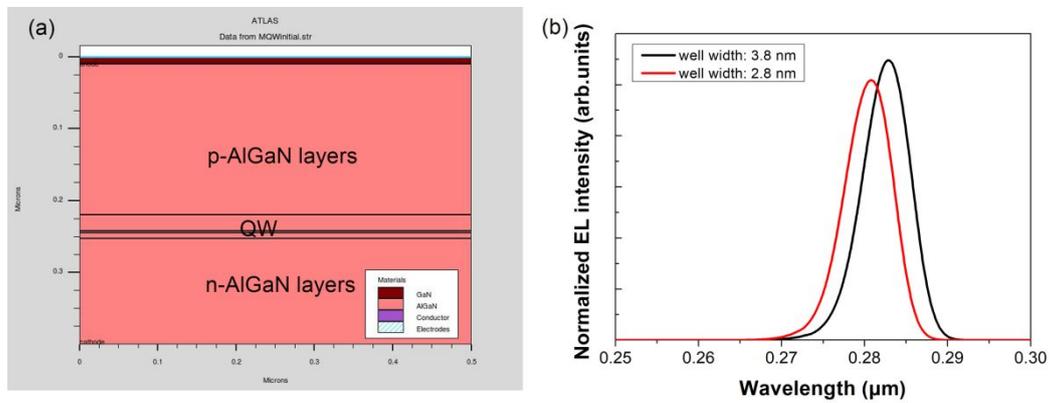
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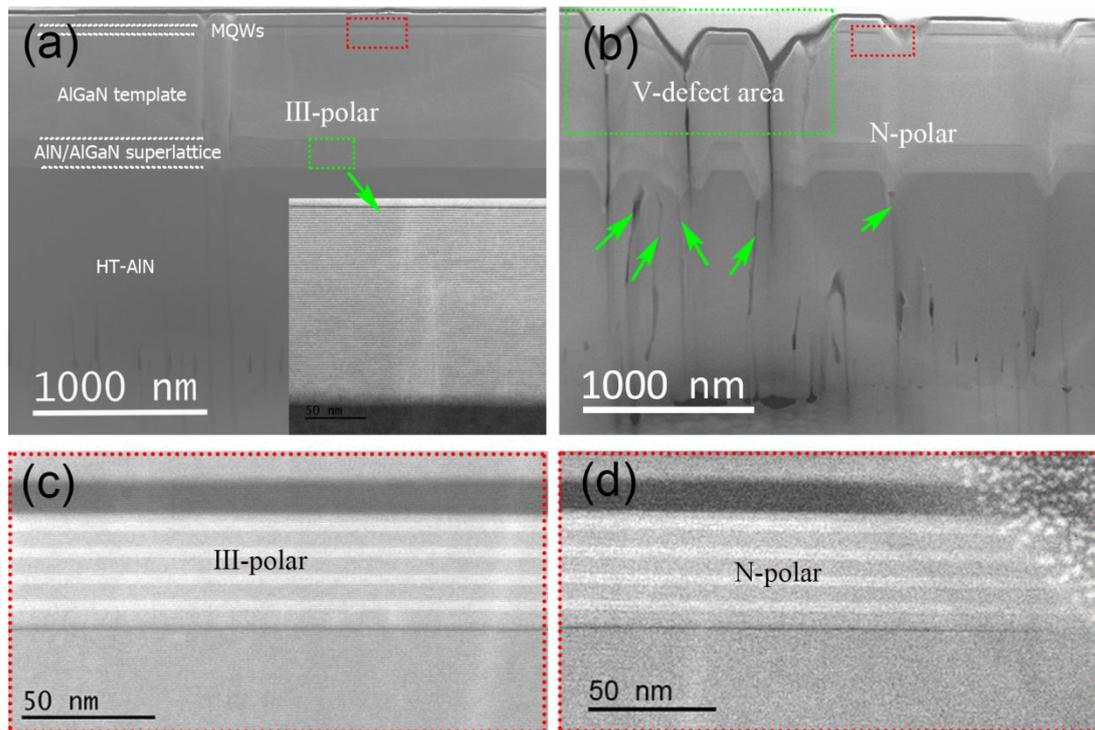
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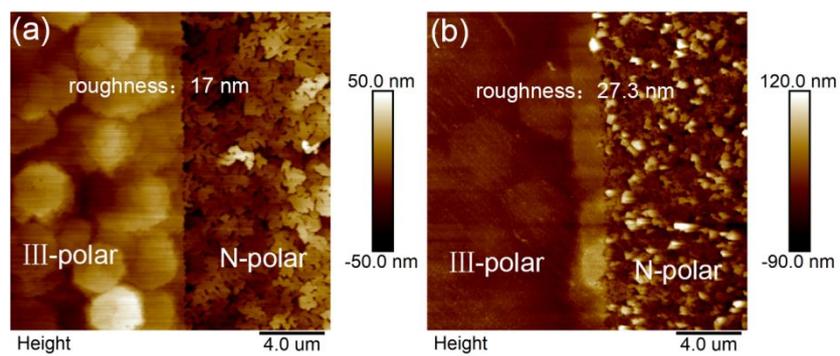
**Figure S1.** FWHM values of HRXRD RC of AlGaIn template in N and III-polar domains of Sample B. 10 data points were measured in each domain in order to minimize measurement error.



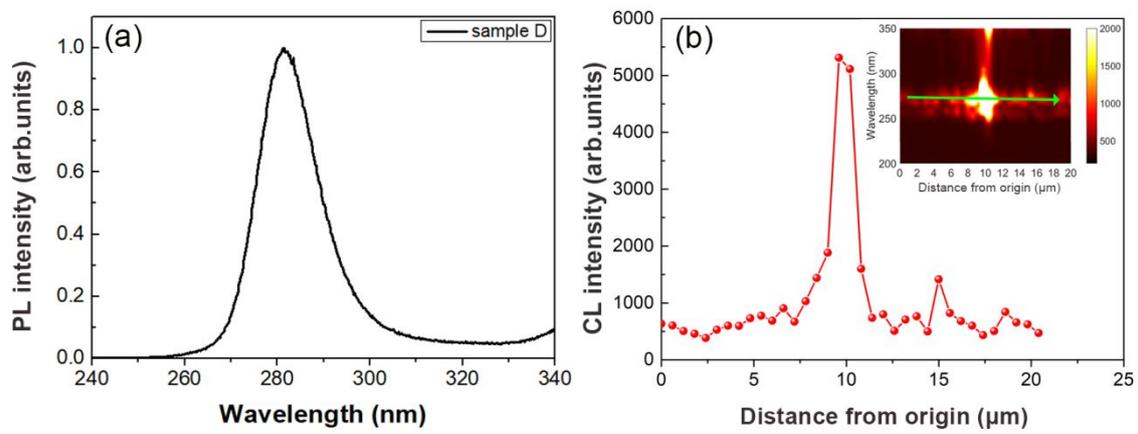
**Figure S2.** Schematic structure of SQW LED with QW width of 2.8 nm and 3.8 nm, respectively (a); Corresponding EL emission spectrum illustrating only 3 nm peak difference (b).



**Figure S3.** Low magnification cross-sectional HAADF STEM image of sample D in III-polar domain (a) and N-polar domain (b); Zoom-in views of the MQWs of III-polar domain (c) and N-polar domain (d). N-polar domain was taken from a V-defect area to directly compare with adjacent MQWs in III-polar domains. No Ga-enrichment or thickness fluctuation is observed.



**Figure S4.** Topographic AFM images of sample D (a) and sample B (b) in a  $20 \times 20 \mu\text{m}^2$  region.



**Figure S5.** RT-PL spectrum of sample D (a); CL intensity distribution at wavelength of 275 nm across IDB region of sample D (b). The collection direction is indicated by the arrow in the inset picture.