Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Electrically Pumped Fabry-Perot Microlasers From Single Ga-Doped ZnO Microbelt based Heterostructure Diodes

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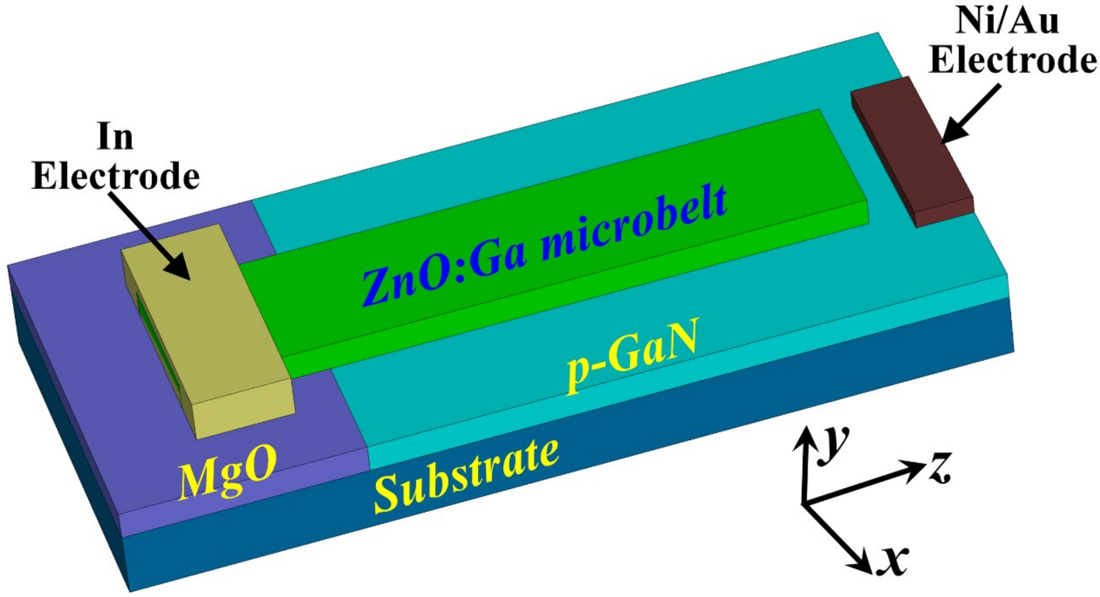

Figure S1: Schematic diagram of heterostructured light-emitting devices comprising single n-ZnO:Ga microbelt and p-GaN layer.

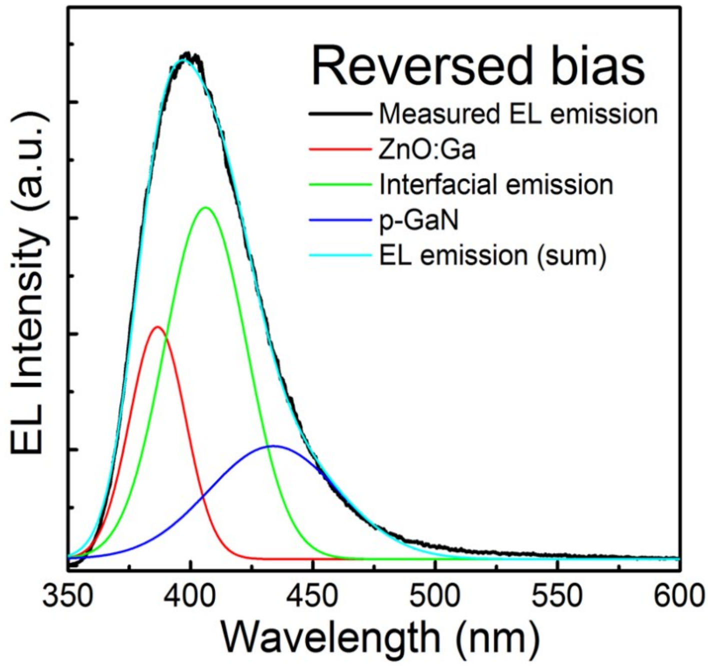

Figure S2: Gaussian deconvoluted for three distinct sub-bands of a representative EL spectrum (8.5 mA): 382 nm originated from ZnO:Ga microbelts, 408 nm derived from interfacial emission between ZnO:Ga microbelt and p-GaN layer, 445 nm originated from p-GaN.

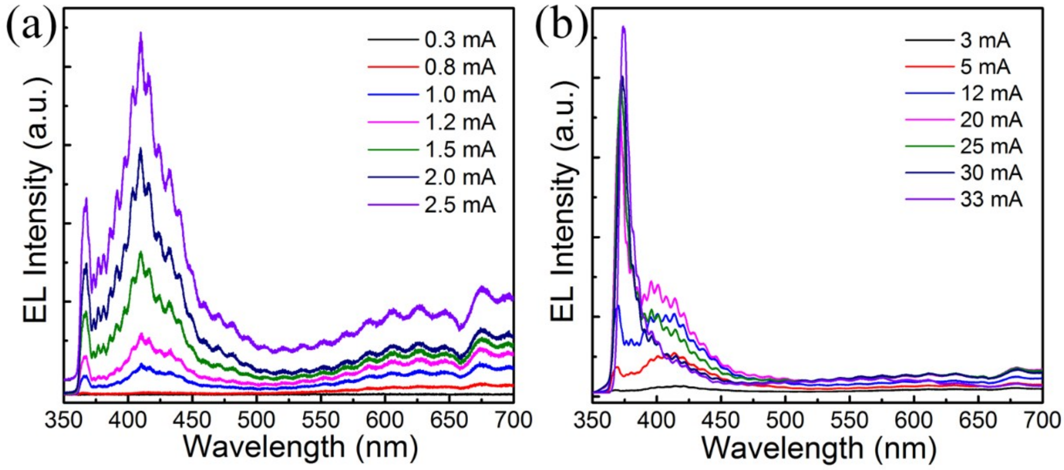

Figure S3 Electrically driven light-emitting from single ZnO:Ga microbelt based heterojunction diode, which operated under forward bias: (a) Measured EL spectra with the forward injection currents ranged from 0.3 mA to 2.5 mA, the dominant emission wavelengths centered at 370 nm and 410 nm respectively; (b) Measured EL spectra with the forward injection currents ranged from 3.0 mA to 33.0 mA, the dominant emission wavelengths centered at 375 nm, accompanied with the efficaciously suppression of the interfacial emission.

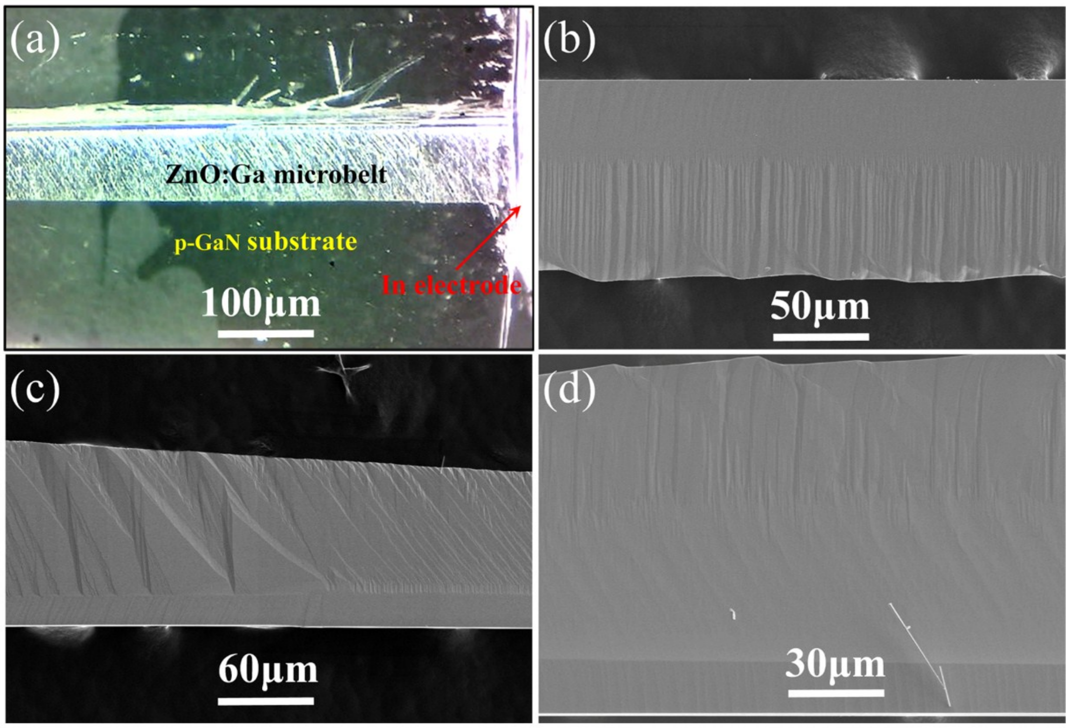

Figure S4: (a) Micrograph of heterostructured light-emitting devices comprising single ZnO:Ga microbelt and p-GaN substrate. (b)-(d) SEM images of the synthesized ZnO:Ga microbelts, which demonstrated that smooth morphologies could be formed along one side of the microbelts, while the other side displayed corrugated-shaped morphologies; therefore, quasi- trapezoidal cross section can be obtained.

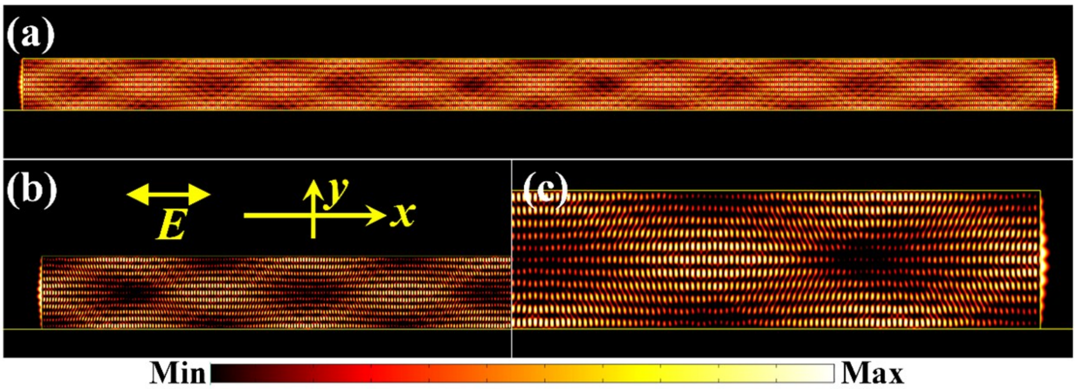

Figure S5 Theoretical numerical simulation on the electrical filed distribution of single mcrobelt: (a) The simulation on the standing wave field distributions confined in the rectangular cross section along the *x*-*y* plane. (b) and (c) Amplified standing wave field distributions of the both end of the microbelt. Considering that the parameters being employed during simulation, n = 10^{20} cm^{-3}, n_{ZnO} = 2.5, n_{quartz} = 1.5, n_{air} = 1, and the sizes of microbelts denoted as the width L = 100 µm, with the thickness denoted as 5 µm. The corresponding calculated wavelength λ_0 = 410 nm. The center of the microbelts defined the origin (x = y = 0).

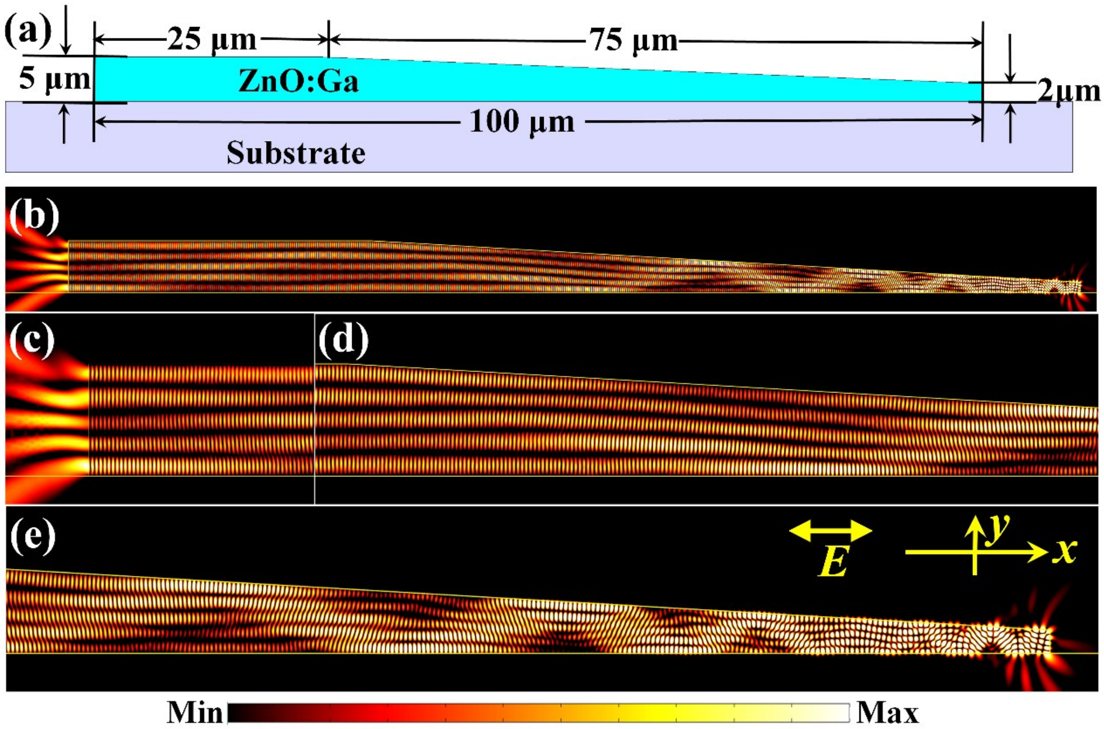

Figure S6: (a) Detailed sizes of the quasi-trapezoidal cross section of the synthesized ZnO:Ga microbelts, which demonstrated in the Figure S5. (b) Numerical simulation on the standing wave field distributions confined in the quasi-trapezoidal cross section along the *x*-*y* plane. (c)- (e) Amplified standing wave field distributions of the microbelt. Considering that the parameters being employed during simulation, $n = 10^{21}$ cm^{-3}, $n_{ZnO:Ga} = 2.5$, $n_{quartz} = 1.5$, $n_{air} = 1$. The corresponding calculated wavelength $\lambda_0 = 450.5$ nm. The center of the microbelts defined the origin ($x = y = 0$).