SUPPORTING INFORMATION

Photoluminescence performance enhancement of ZnO/MgO heterostructured nanowires and their applications in ultraviolet laser diodes

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Angular-dependent EL measurements

Figure S1 presents the lasing spectra observed at different placement angles relative to the detector above the threshold. One can see that the lasing action can be clearly observed in all the four recording configurations, and the positions and intensities of the lasing peaks vary randomly in the EL spectra.

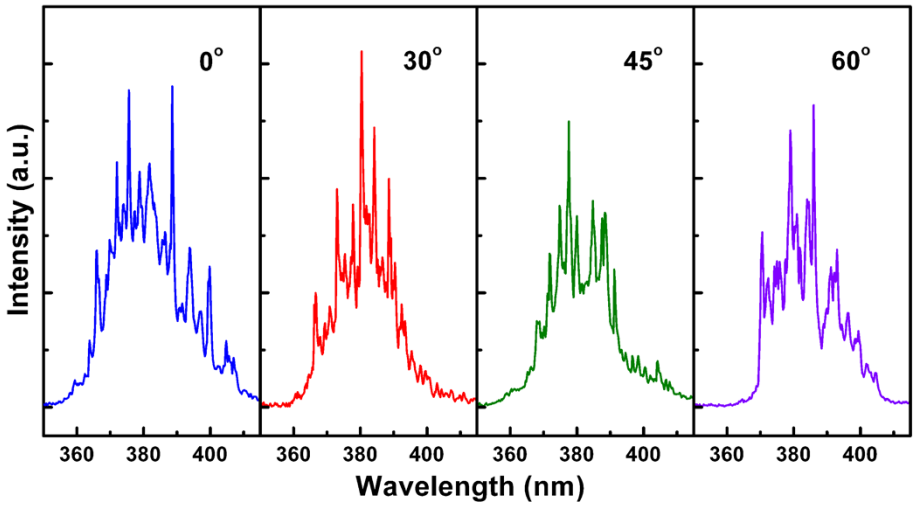

FIG. S1. EL spectra of the laser diode taken from different placement angles relative to the detector operating at 6.4 mA.

Schematic diagrams showing the band alignment of the Au/MgO/ZnO structure

Figure S2 shows the expected simplified band alignment of the Au/MgO/ZnO structure assuming that there are no imperfections at the interfaces. The electrical parameters, electron affinity and energy band gap, of the involved materials are known from literatures.[1-3]

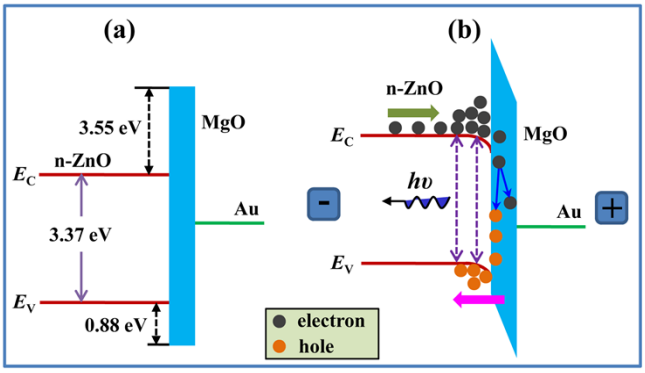

FIG. S2. Energy band diagrams of the heterostructure under (a) thermal equilibrium and (b) positive bias, respectively.

Wide-range EL spectrum in the UV-visible region

Figure S3 shows the wide-range EL spectra of the laser diode operating at 7.9 mA in the UV-visible region. One can see that the device exhibits a relatively weak visible emission at around 500 nm.

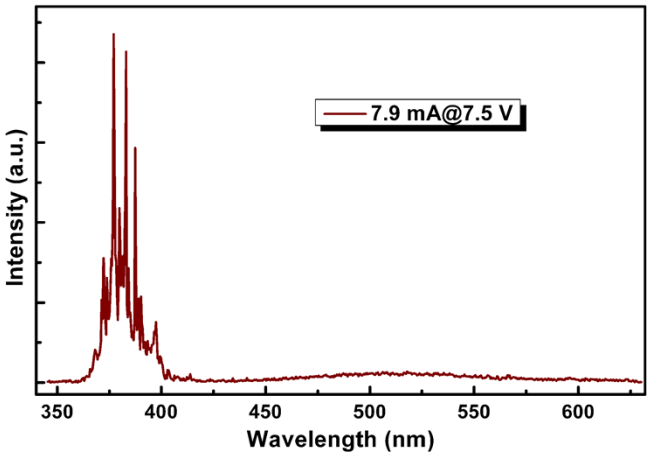

FIG. S3. Room temperature EL spectrum of the device in the UV-visible region.

[1] M. B. Herbert, *J. Appl. Phys.*, 1977, **48**, 4729.

[2] J. A. Aranovich, D. G. Golmayo, A. L. Fahrenbruch and R. H. Bube, *Appl. Phys. Lett.*, 1980, **51**, 4260.

[3] H. Zhu, C. X. Shan, B. Yao, B. H. Li, J. Y. Zhang, Z. Z. Zhang, D. X. Zhao, D. Z. Shen, X. W. Fan, Y. M. Lu and Z. K. Tang, *Adv. Mater.*, 2009, **21**, 1613.