Supporting Information

Whispering Gallery Mode Lasing from Zinc Oxide Hexagonal Nanodisks

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Figure S1 shows lasing data from a nanodisk with diameter 842 nm (same as Figure 2a) that includes the power dependence data plotted on a log-log scale. The log-log plot in Figure S1b shows the classical S-curve that is evidence of a transition from subthreshold to a superlinear regime.

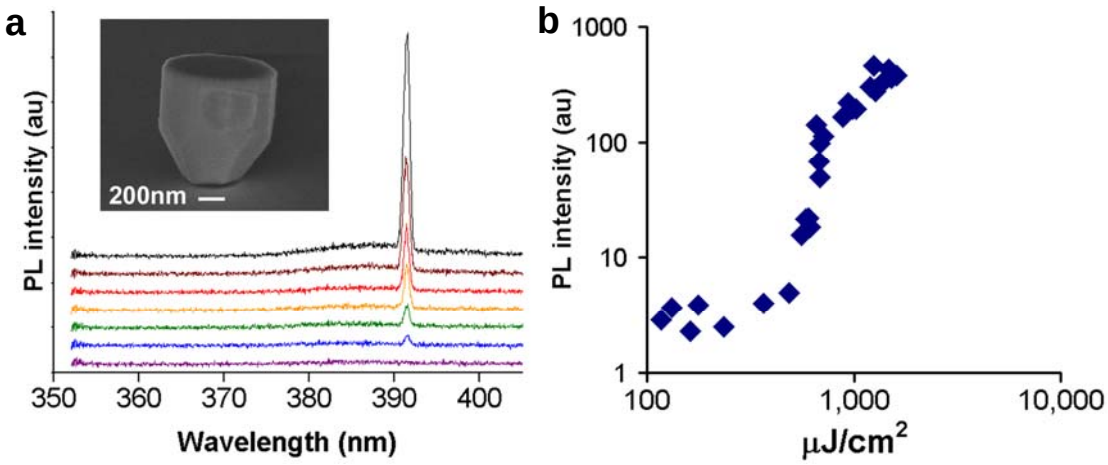

Figure S1. Room-temperature lasing spectra of a ZnO nanodisk. a) PL spectra collected at increased pump energy. (Inset: cross-section SEM image of 842 nm diameter disk.) b) PL intensity versus pump energy plotted on a log-log scale. Transition from subthreshold to superlinear regime occurs at approximately 500 $\mu J/cm^2$.

For ZnO nanodisks with diameters of approximately 1 μm and larger, multiple lasing modes were observed under pulsed excitation. Figure S2 shows the PL spectrum of a disk with a diameter of 970 nm that contains multiple lasing modes in the ZnO spectrum. This is due to the size of the disk cavity being large enough to support more than one resonant mode that overlaps with the spectral bandwidth of ZnO. For disks with diameters below 1 μm, the spacing between resonant modes is larger than the bandwidth of ZnO band-edge PL, causing only a single resonant mode to overlap with the PL spectrum. At a wavelength of 390 nm and a refractive index of 2.45 for ZnO, the calculated mode spacing, $\Delta\lambda$, is 22 nm for an 842 nm diameter disk for both TE- and TM- modes. [*Physical Review Letters* **2004,** 93, 103903] For the smaller diameter nanodisks reported in this paper, the mode spacing is even greater. Ultimately, since the spectral bandwidth of ZnO PL at room temperature is roughly 16 nm, the appearance of two resonant modes in the ZnO PL spectrum is highly unlikely. As such, almost all nanodisks tested exhibited only a single resonant lasing mode.

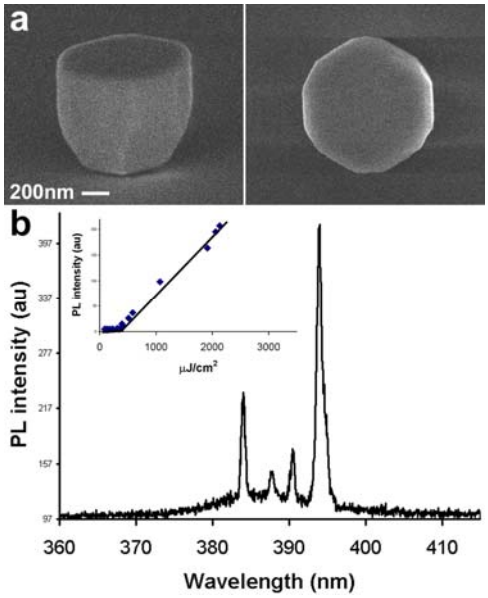

Figure S2. Room-temperature PL spectrum of a ZnO disk by pulsed-excitation showing multiple lasing modes. a) Cross-section and top-down SEM images of 970 nm diameter disk. b) PL spectrum showing multiple lasing modes. (Inset: power-dependence plot showing lasing threshold of approximately 350 $\mu J/cm^2$.)