Electronic Supporting Information

Counterintuitive increase in optical scattering efficiency during negentropic orientational transition in dilute ZnO nanowire suspensions

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The phase composition of the synthesized ZnO NWs was analysed by powder X-ray diffraction and Rietveld refinement. The powders were hand-milled in acetone for 5 minutes, transferred into a glass capillary of 500 μm in diameter (Mark tube No. 4007805, glass no. 10, Hilgenberg, Malsfeld, Germany) and measured on a Bruker D8 Advance diffractometer (Bruker, Karlsruhe, Germany). The 2θ scan range was 25° - 120° (step size of 0.0122°) using (Ni- and digitally filtered) Cu *Kα* X-radiation. The counting time was 6.5 seconds per step. Rietveld refinement was carried out with the software BGMN version 4.2.22. Refined parameters included the scale factor, unit cell dimensions *a* and *c*, and anisotropic peak broadening. The latter parameter was used by the refinement software to calculate the mean crystallite domain sizes. The measured XRD pattern of ZnO NWs is shown in Figure S1, which confirms that the NWs have phase-pure zincite crystal structure of space group $P6_3mc$ (no. 186).

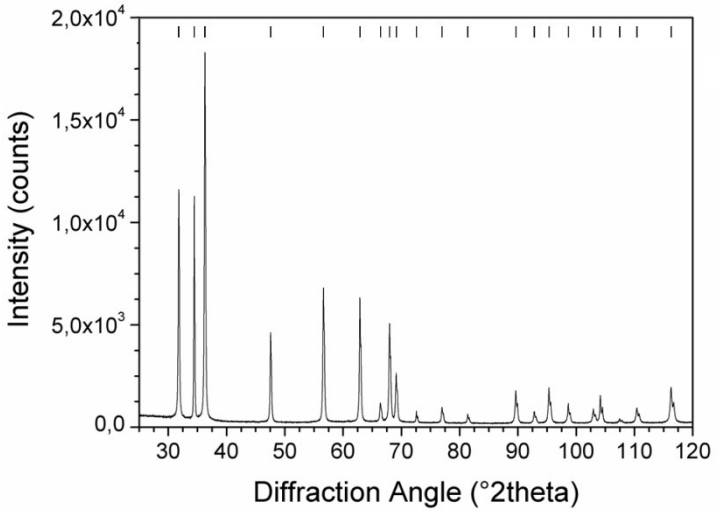

Figure S1. X-ray diffraction patterns of ZnO NWs. The peak positions of the zincite structure model (*Kisi et al.*, Acta Cryst. C, 45 (1989) 1867-1870) are shown at the top of the graph.

Microstructural features of solvothermally synthesized ZnO NWs were studied by Scanning electron microscopy using FEI FIB-SEM Helios Nanolab 600. Synthesis yield hexagonal single crystal nanowires which are consistent with the hexagonal structure of ZnO.

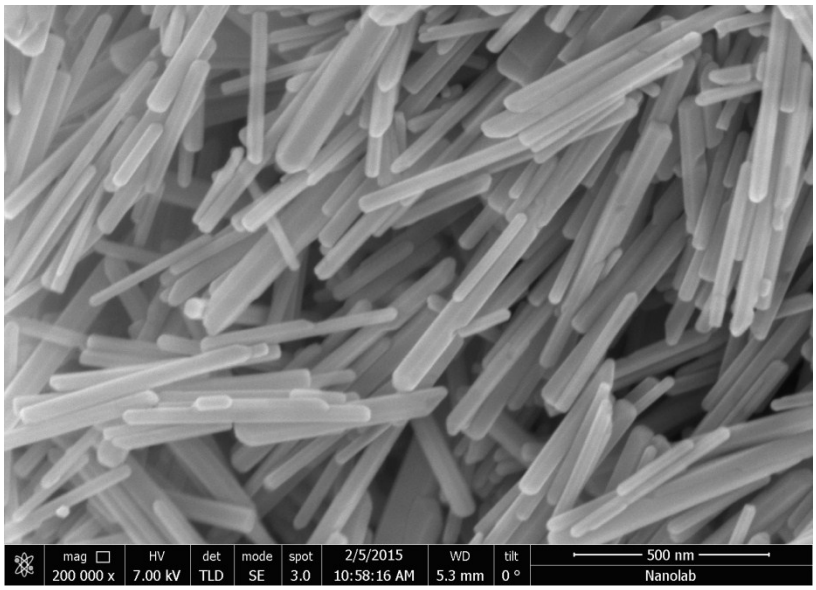

Figure S2. SEM image ZnO NWs

Diffuse light absorbance of ZnO NWs was measured on UV-Visible Shimadzu UV-3700 spectrophotometer (Shimadzu Scientific Instruments Kyoto, Japan). Figure S3 shows the UV-NIR absorption spectra. ZnO NWs exhibit a sharp absorption edge below 400 nm while are transparent in visible and IR with intrinsic bandgap of 3.21 eV (as found from $(\alpha h\nu)^2$).

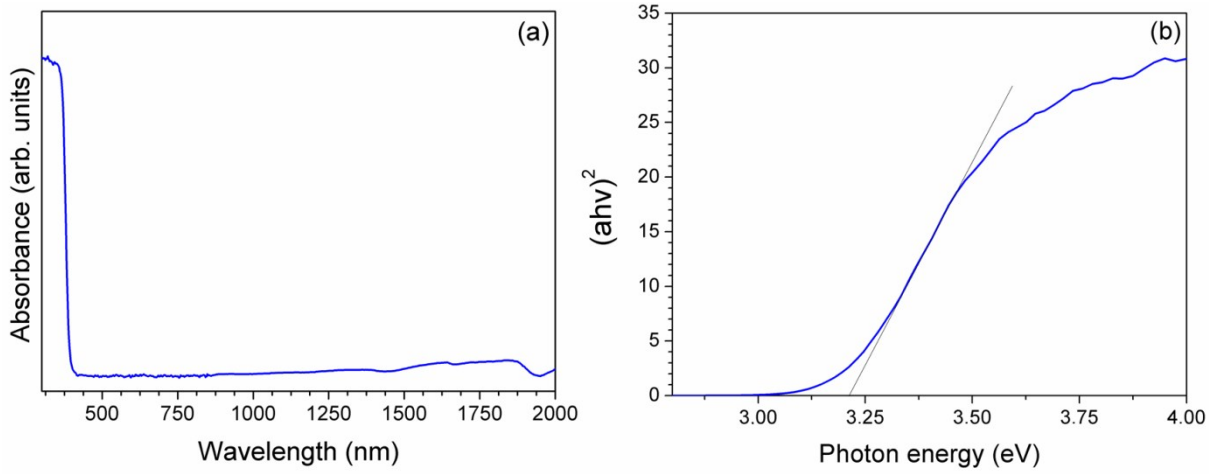

Figure S3. The UV-vis-NIR absorption spectra of ZnO NWs (a) and a plot of $(\alpha h\nu)^2$ versus the incident photon energy (b).