Supplementary

Homogeneous vertical ZnO nanorod arrays with high conductivity on an *in situ* Gd nanolayer

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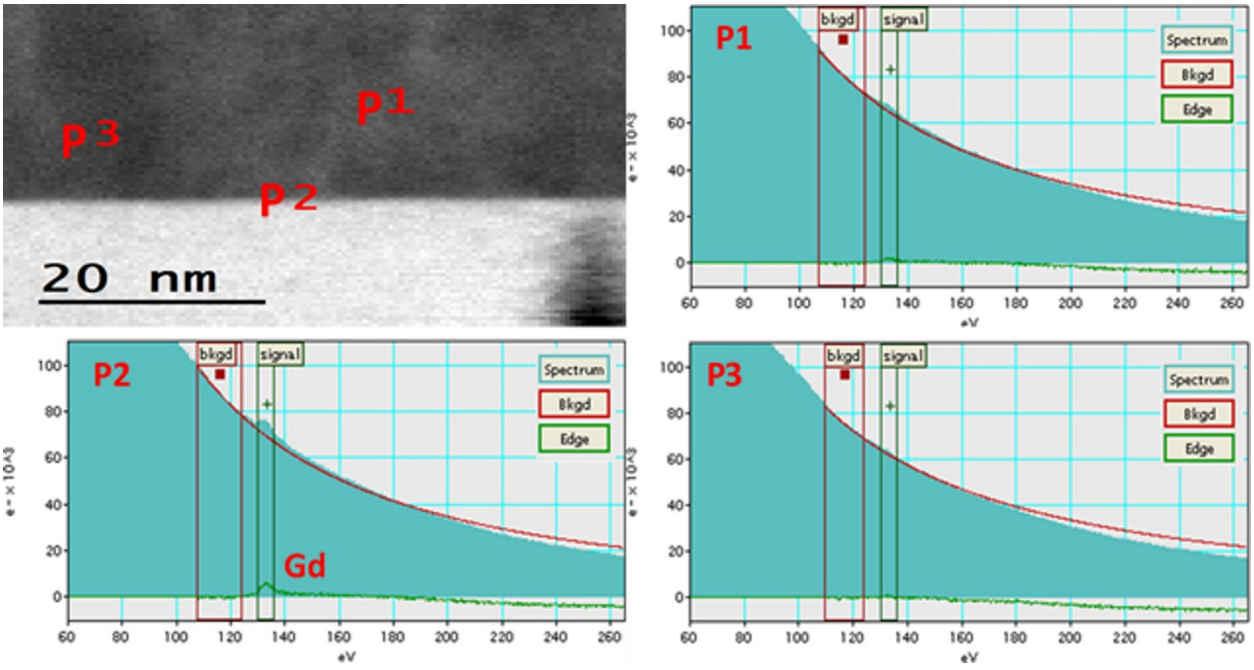

Figure S1. TEM cross section in the interface between the substrate (a-Al_2O_3) and Gd doped ZnO wetting layer. Electron energy loss spectroscopy (EELS) in different position P1, P2, P3 near the interface between substrate and ZnO, indicating Gd concentration decreases above the interface.

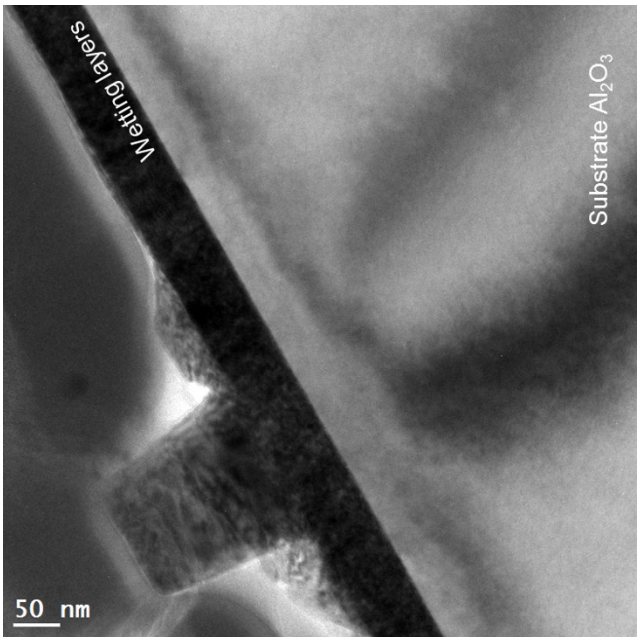

Figure S2. TEM image of Gd-doped ZnO wetting layers with homogenous thickness (~50nm).

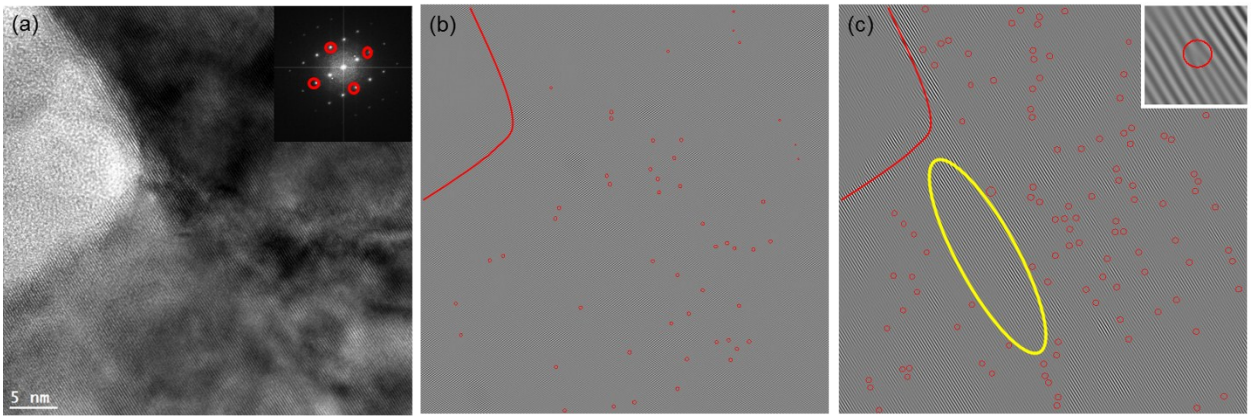

Figure S3. (a) TEM image near the interface between wetting layers and NR. Inset (a) is the corresponding FFT pattern of all area, inverse FFT image from (b) the (11-20) spots in FFT pattern in (a), (c) the (0002) spots in FFT pattern in (a). Edge dislocation distribution is shown by red circles in (b) and (c). Inset (c) is magnified edge dislocation. The dislocations disappear in the most interface area (circled by yellow line), then the density increases slightly above the interface.

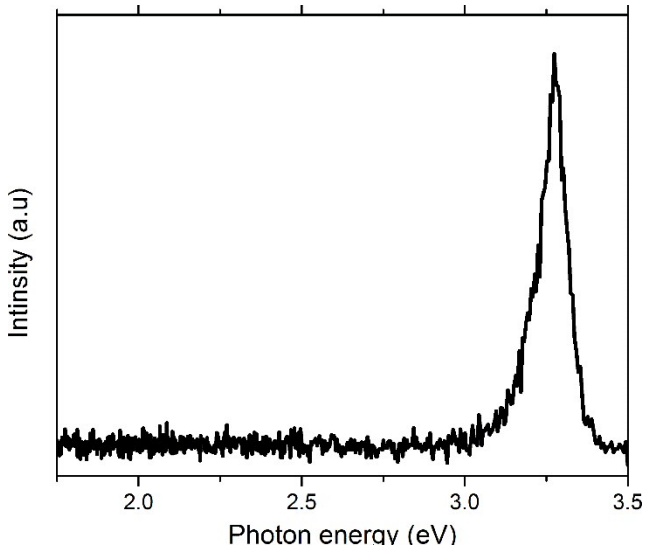

Figure S4. CL spectrum of ZnO NRs (deposited at $P(O_2)$ = 200 mTorr) at RT shows sharp NBE with no defect band, indicating high crystal quality.