## Supporting Information

## Single Crystalline Wurtzite ZnO/Zinc Blende ZnS Coaxial Heterojunctions and Hollow Zinc Blende ZnS Nanotubes: Synthesis, Structural Characterization and Optical Properties

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**Fig. S1** Crystallographic unit cell of (a) WZ and (b) ZB ZnS; periodic structure model of (c) WZ and (d) ZB ZnS.



**Fig. S2** (a) SEM image of ZnO nanorods; (b) TEM image of a single ZnO nanord; (c) HRTEM image of the ZnO nanorod, inset shows the corresponding SAED pattern.



**Fig. S3** (a) Top view SEM image of the ZnO nanorod; (b) TEM image of the ZnO/ZnS core/shell cross sections.



**Fig. S4** Schematic illustration of nanoscale Kirkendall effect in the formation of WZ ZnO/ZB ZnS coaxial heterojunction.



Fig. S5 SEM images of (a) the ZnO nanorod and (b) the ZnO nanorod after heating at 550°C for two hours in  $Ar:H_2$  (95%:5%) atmosphere.



**Fig. S6** XRD pattern, showing a ZB structure of the prepared ZnS nanotubes. The sharp intense peak at about 34.5° is from the residual ZnO.



Fig. S7 Schematic energy band diagram of ZnO/ZnS core/shell heterostructure under illumination.



**Fig. S8** (a) HRTEM image of the ZnS shell and (b) IFFT image from the marked square region of (a), showing clearly stalking faults in ZnS shell due to the large lattice mismatch between the core and shell.