

Supporting Information

**Two-storey structure photoanode of 3D
 $\text{Cu}_2\text{ZnSnS}_4/\text{CdS}/\text{ZnO}$ @steel composite nanostructure for
efficient photoelectrochemical hydrogen generation**

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The TEM image of the ZnO/CdS core/shell NR in figure S1(a) shows the rough surface of CdS obtained by successive ionic layer adsorption and reaction (SILAR) process. Besides, the figure S1(b) specifically shows the rough CdS shell (It can be obtained through the etching of ZnO core in acid solution). When the CdS layer is deposited on ZnO NR by SILAR, it formed nanocrystalline (7~10 nm) structure. In particular, the reason why the tip of ZnO NR is rougher is because of the polarity of ZnO (001) plane. More Cd^+ and S^- ions are adsorbed on the polar, reactive surface.

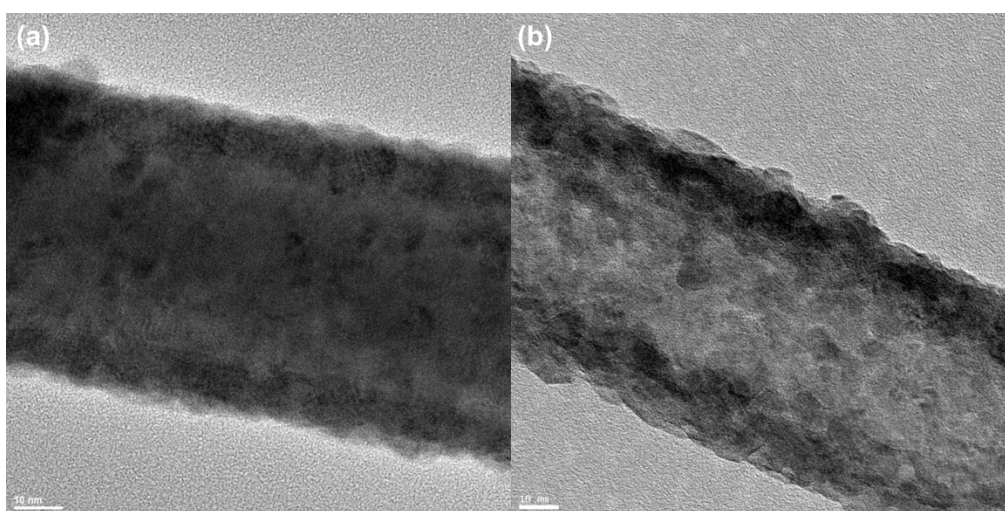


Figure S1. The TEM image of (a) ZnO/CdS NR and (b) CdS nanotube.