Supporting Information

Cobalt Oxide Nanoparticles on TiO$_2$ Nanorod/FTO as a Photoanode with Enhanced Visible Light Sensitization

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Figure SI 1. (a) Images of electrodeposited Cobalt oxide on hydrothermally grown TiO$_2$/FTO by before and after annealing (b) EDS mapping of Cobalt oxide nanoparticle on TiO$_2$ nanorod/FTO

![Figure SI 1](image)

Figure SI 2. EELS spectrum of Cobalt oxide nanoparticle on TiO$_2$ nanorod/FTO annealed in air at (a), (b), (c) 500°C (d) 600°C
Figure SI 3. TEM image, Lattice-fringe, and SAED pattern of Cobalt oxides nanoparticles on TiO$_2$ nanorod with (a), (b), and (c) 20 seconds, (d), (e), and (f) 40 seconds and (g), (h), and (i) 60 seconds of electrodeposition time and annealing at 500$^\circ$C in air.
Figure SI 4. (a),(b), (c), (d), (e), and (f) TEM images of Cobalt oxides nanoparticles on TiO$_2$ nanorod with annealing temperature of 700°C, 600°C, 500°C, 400°C, 375°C and 350°C respectively in air.

Figure SI 5. Lattice fringe TEM images and SAED patterns of Cobalt oxides nanoparticles on TiO$_2$ nanorod with annealing temperature of 600°C, 500°C, 400°C and 375°C respectively in air.
Figure SI 6. TEM images of Cobalt oxides nanoparticles on TiO$_2$ nanorod with annealing temperature of 700$^\circ$C, 600$^\circ$C, 500$^\circ$C, 400$^\circ$C, 375$^\circ$C, and 350$^\circ$C respectively in N$_2$.

Figure SI 7. Lattice fringe TEM images and SAED pattern of Cobalt oxides nanoparticles on TiO$_2$ nanorod with annealing temperature of 600$^\circ$C, 500$^\circ$C, 400$^\circ$C and 375$^\circ$C respectively in N$_2$. 
Figure SI 8. Relation between particle size with respect to electrodeposition time of Cobalt and its oxide formed on TiO\textsubscript{2} nanorods.

Figure SI 9. Comparison of photocurrent density-voltage diagram of Cobalt oxide/TiO\textsubscript{2} nano-structure and TiO\textsubscript{2} nanorod on FTO in 0.1 M Na\textsubscript{2}S aqueous solution with light intensity 100 mW/cm\textsuperscript{2} annealed in air with various electrodeposition time of 20, 40, and 60 seconds (a) white light (b) visible light.
Figure SI 10. Comparison of photocurrent density-voltage diagram of Cobalt oxide/TiO$_2$ nanostructure and TiO$_2$ nanorod on FTO in 0.1 M Na$_2$S aqueous solution with light intensity 100 mW/cm$^2$ annealed in air and nitrogen at 600$^\circ$C, 400$^\circ$C, and 350$^\circ$C.
Figure SI 11. Comparison of photocurrent density-voltage diagram of Cobalt oxide/TiO$_2$ nanostructure to that of bare Cobalt oxide and TiO$_2$ nanorod on FTO in 0.1 M Na$_2$S aqueous solution with light intensity 100 mW/cm$^2$ annealed in air at 500$^\circ$C (a) white light (b) visible light.

Figure SI 12. Photocurrent density kinetics of Cobalt oxide/TiO$_2$/FTO and TiO$_2$/FTO with biased ($V_b = 0.5$ V vs Ag/AgCl) electrodes in 0.1 M Na$_2$S (pH = 12.5) solution under white light irradiation (100 mW/cm$^2$).