

## Supporting Information

### All-Solution-Processed BiVO<sub>4</sub>/TiO<sub>2</sub> Photoanode with NiCo<sub>2</sub>O<sub>4</sub> Nanofiber Cocatalyst for Enhanced Solar Water Oxidation

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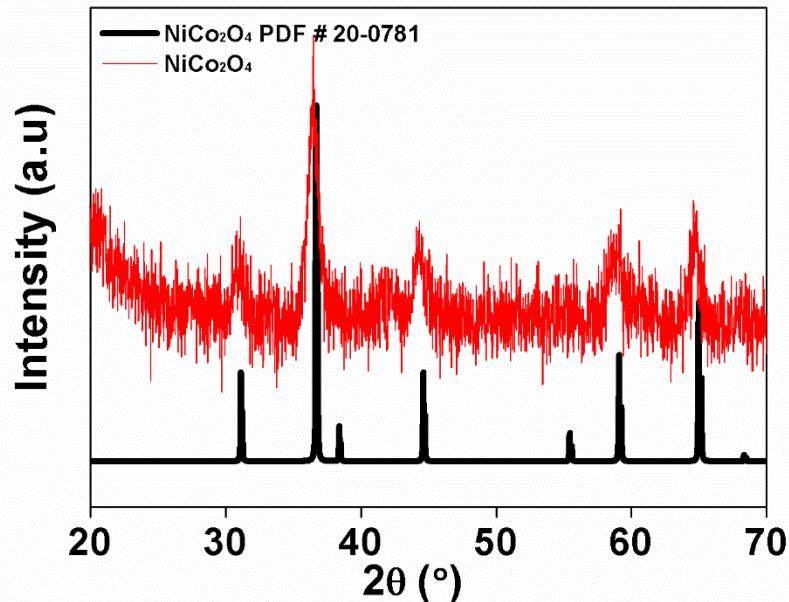
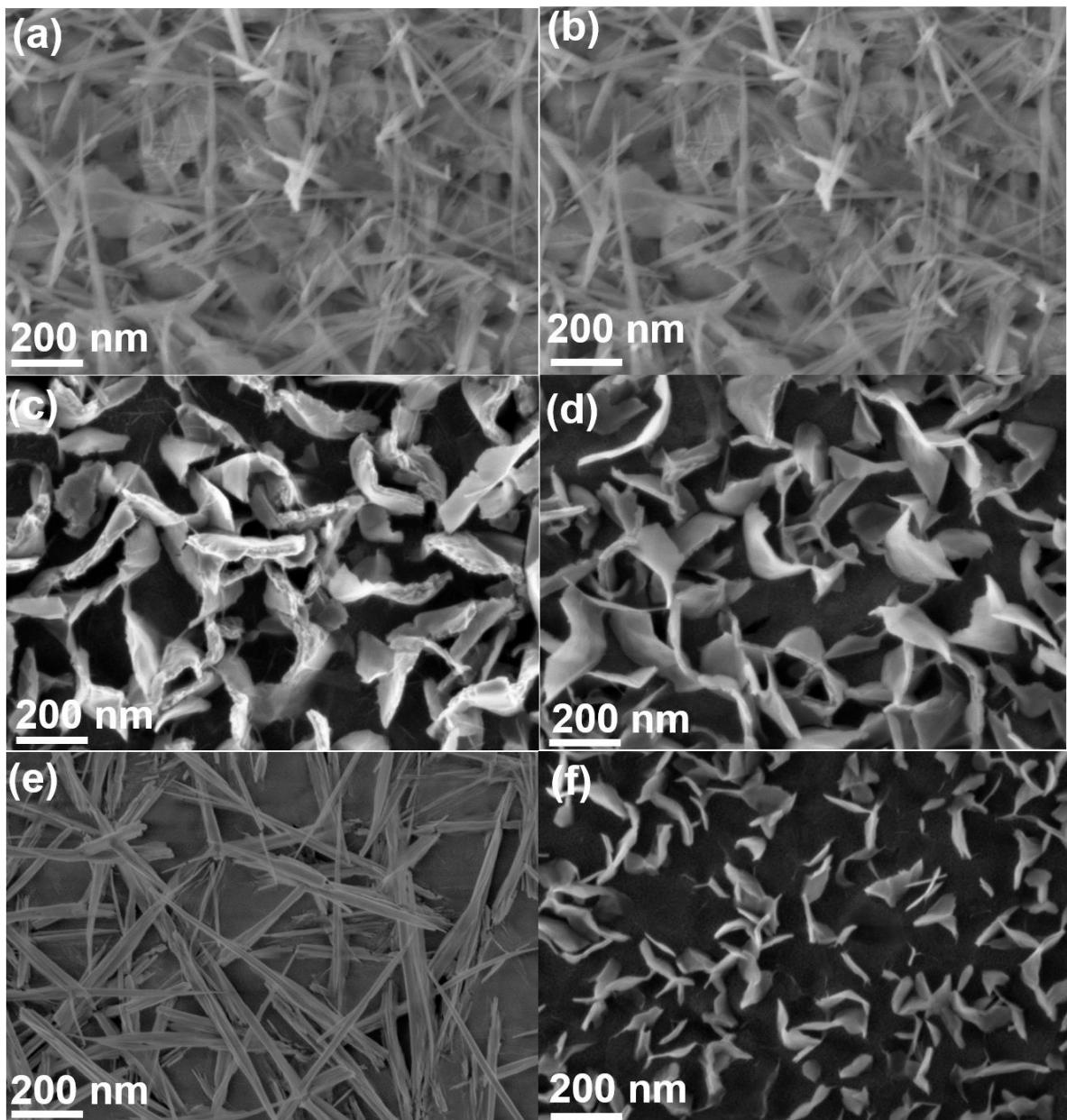
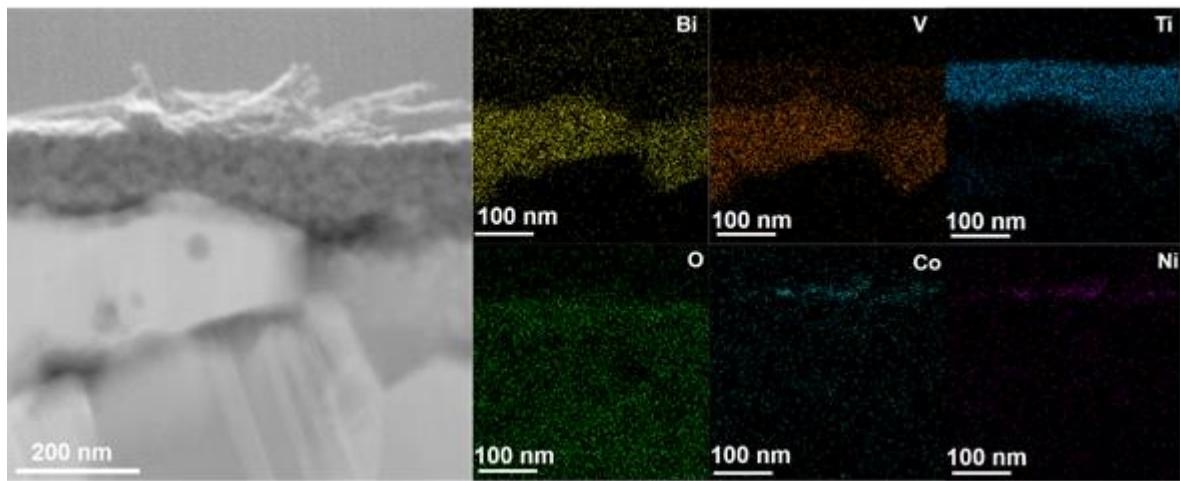


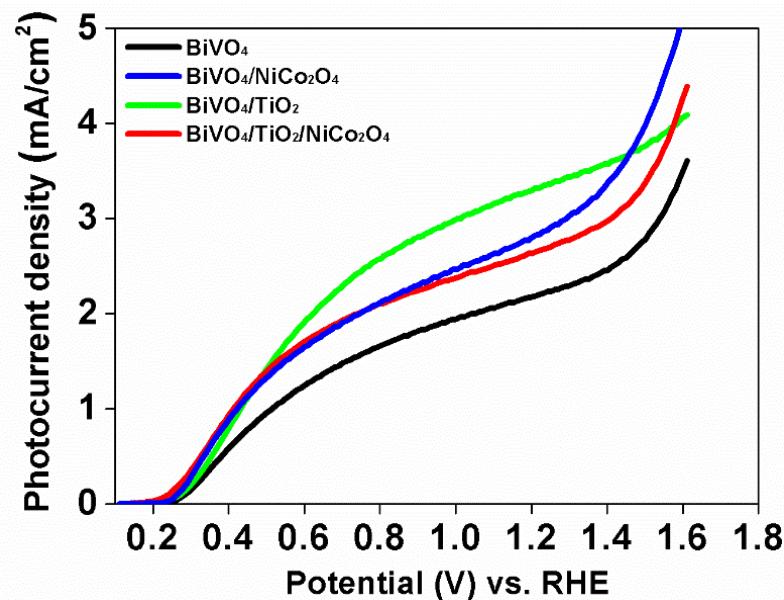
Figure S1. Powder XRD of NiCo<sub>2</sub>O<sub>4</sub>.



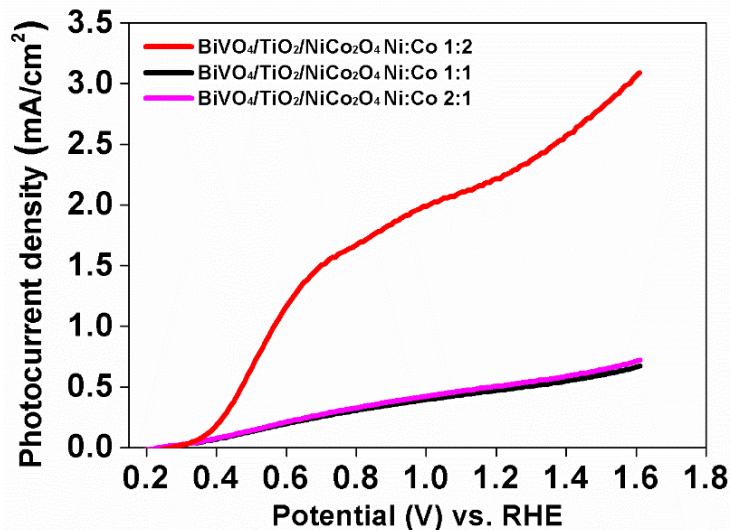
**Figure S2.** SEM images: (a) top view of BiVO<sub>4</sub> (b) BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub> (c)BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> Ni/Co 0.5 (d) BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> Ni/Co 0.8, (e) BiVO<sub>4</sub>/TiO<sub>2</sub>/Co<sub>2</sub>O<sub>3</sub>, (f) BiVO<sub>4</sub>/TiO<sub>2</sub>/NiO.



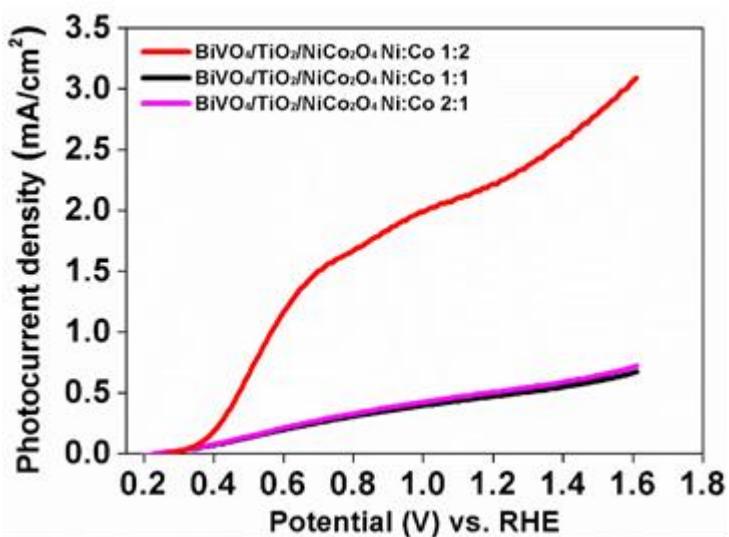
**Figure S3.** HRTEM images of  $\text{BiVO}_4/\text{TiO}_2/\text{NiCo}_2\text{O}_4$ .



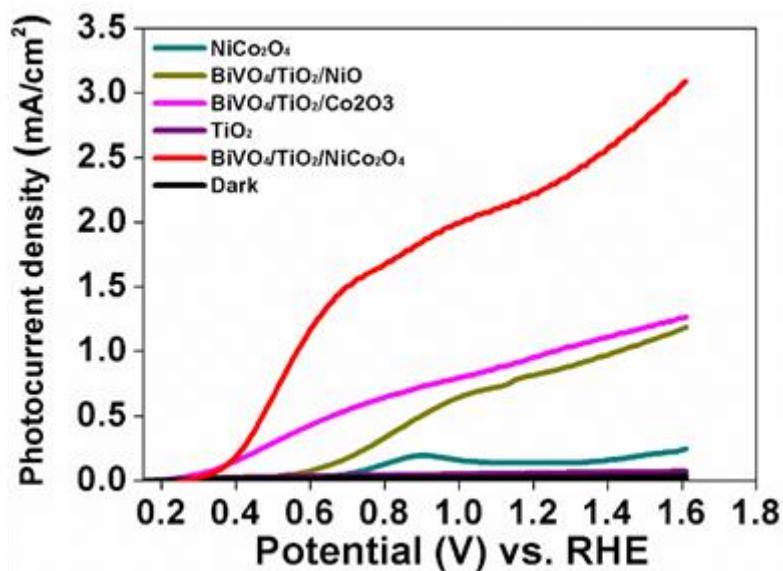
**Figure S4.** Linear sweep voltammogram (LSV) of  $\text{BiVO}_4$ ,  $\text{BiVO}_4/\text{TiO}_2$ , and  $\text{BiVO}_4/\text{TiO}_2/\text{NiCo}_2\text{O}_4$  in the presence of the  $\text{Na}_2\text{SO}_3$  hole scavenger with phosphate buffer.



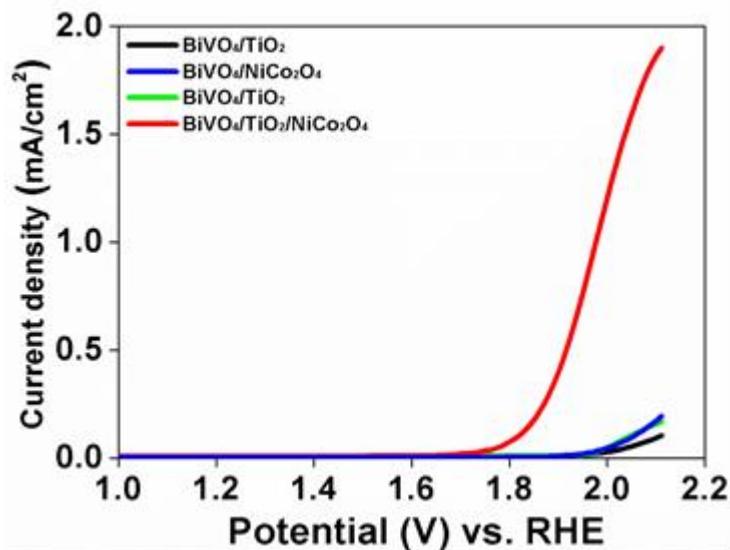
**Figure S5.** LSV of BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> synthesized at different temperature.



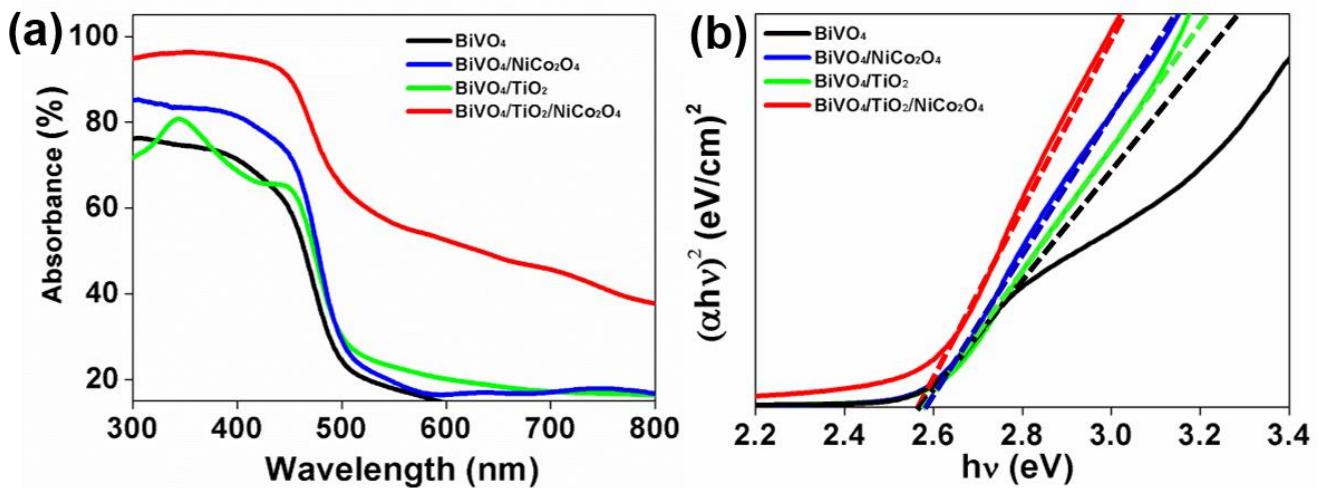
**Figure S6.** LSV of BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> at various compositions of Ni and Co.



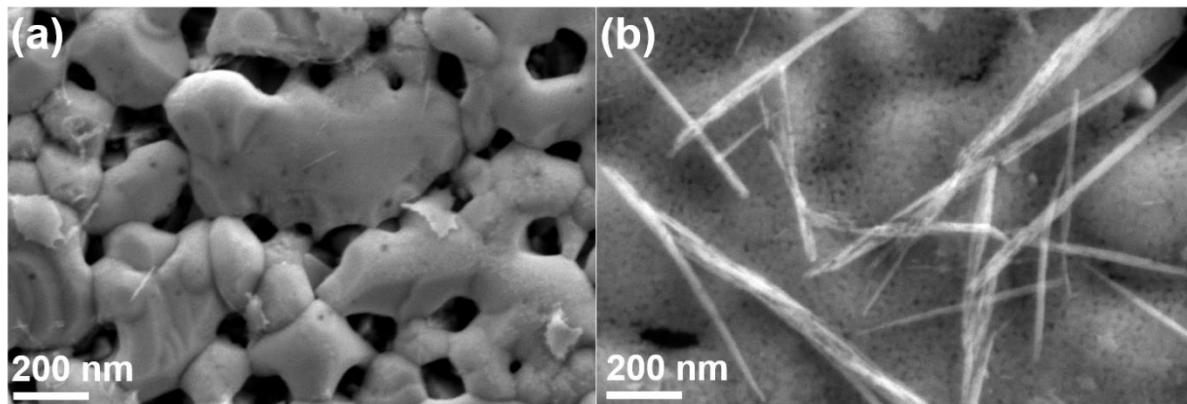
**Figure S7.** LSV of  $\text{BiVO}_4/\text{TiO}_2/\text{NiCo}_2\text{O}_4$ ,  $\text{BiVO}_4/\text{TiO}_2/\text{Co}_2\text{O}_3$ ,  $\text{BiVO}_4/\text{TiO}_2/\text{NiO}$ ,  $\text{TiO}_2$ , and  $\text{NiCo}_2\text{O}_4$ .



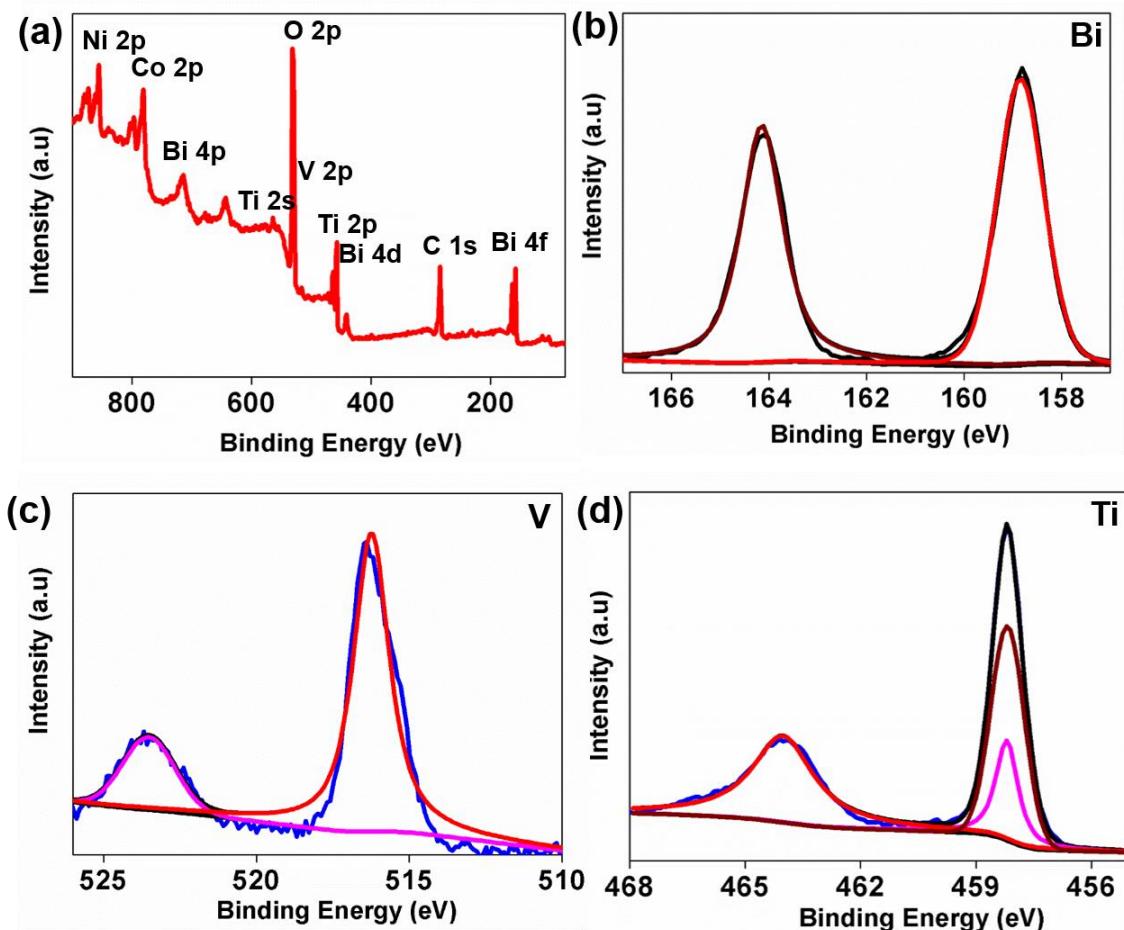
**Figure S8.** LSV of  $\text{BiVO}_4$ ,  $\text{BiVO}_4/\text{TiO}_2$ ,  $\text{BiVO}_4/\text{NiCo}_2\text{O}_4$ , and  $\text{BiVO}_4/\text{TiO}_2/\text{NiCo}_2\text{O}_4$  in the dark.



**Figure S9.** (a) Absorbance spectra and (b) Tauc plot of BiVO<sub>4</sub>, BiVO<sub>4</sub>/TiO<sub>2</sub>, BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub>, and BiVO<sub>4</sub>/TiO<sub>2</sub> /NiCo<sub>2</sub>O<sub>4</sub>.



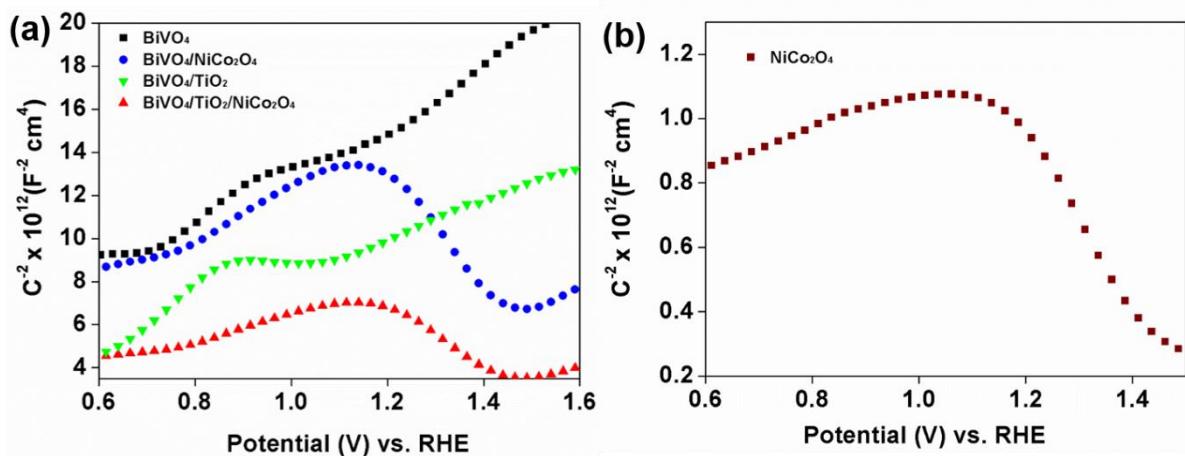
**Figure S10.** SEM images of (a) BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub> and (b) BiVO<sub>4</sub>/TiO<sub>2</sub> /NiCo<sub>2</sub>O<sub>4</sub> after long-term stability measurements.



**Figure S11.** (a) Wide scan, (b) Bi 4f, (c) V, and (d) Ti XPS of BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub>.

**Table S1.** Nyquist plot fitted results in  $\Omega$  for various samples of BiVO<sub>4</sub>, BiVO<sub>4</sub>/TiO<sub>2</sub>, BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub>, and BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> photoanodes.

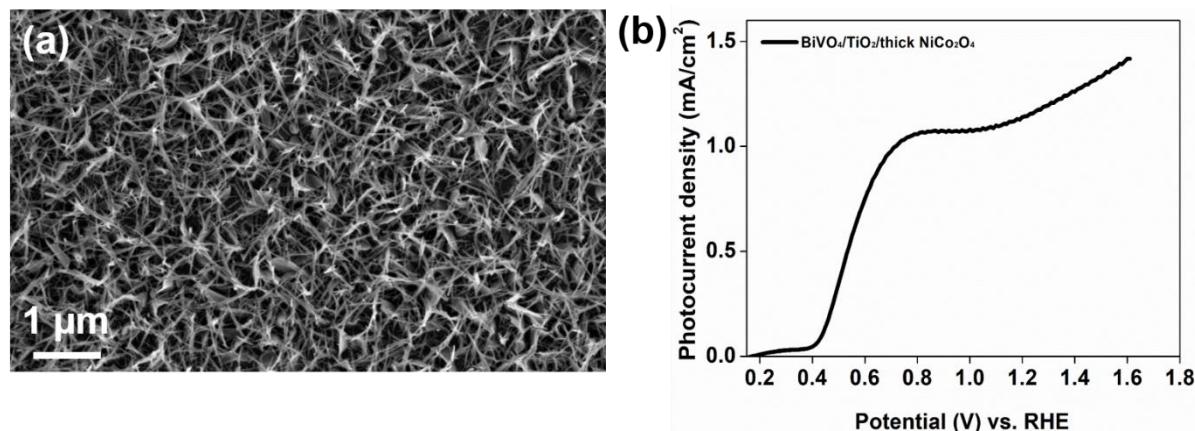
Sample	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>
BiVO <sub>4</sub>	72.97	$1.0 \times 10^{-7}$	7613
BiVO <sub>4</sub> /NiCo <sub>2</sub> O <sub>4</sub>	$1.0 \times 10^{-7}$	3787	95.94
BiVO <sub>4</sub> /TiO <sub>2</sub>	110.2	9183	6934
BiVO <sub>4</sub> /TiO <sub>2</sub> /NiCo <sub>2</sub> O <sub>4</sub>	31.68	379.7	63.46



**Figure S12.** Mott-Schottky behavior of (a) BiVO<sub>4</sub>, BiVO<sub>4</sub>/TiO<sub>2</sub>, BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub>, and BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub> (b) NiCo<sub>2</sub>O<sub>4</sub>.

**Table S2.** Flat band potential for BiVO<sub>4</sub>, BiVO<sub>4</sub>/TiO<sub>2</sub>, BiVO<sub>4</sub>/NiCo<sub>2</sub>O<sub>4</sub>, and BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub>.

Sample	Flat band potential (V)
BiVO <sub>4</sub>	0.2011
BiVO <sub>4</sub> /NiCo <sub>2</sub> O <sub>4</sub>	0.1570
BiVO <sub>4</sub> /TiO <sub>2</sub>	0.1927
BiVO <sub>4</sub> /TiO <sub>2</sub> /NiCo <sub>2</sub> O <sub>4</sub>	0.117



**Figure S13.** Field-emission scanning electron microscopy (FE-SEM) image in top view (b) Linear sweep voltammogram (LSV) of BiVO<sub>4</sub>/TiO<sub>2</sub>/NiCo<sub>2</sub>O<sub>4</sub>.

Table S3. Atomic ratios obtained from XPS data.

Sample	Ni/Co	Co/O	Ni/O
NiCo <sub>2</sub> O <sub>4</sub>	0.43	0.67	0.33