Supplementary Materials: Improved Charge Separation in WO$_3$/CuWO$_4$ Composite Photoanodes for Photoelectrochemical Water Oxidation

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Figure S1. XRD patterns of different WO$_3$ phases obtained from magnetron sputtering on FTO (red) and normal glass slide (blue) substrates, which showed the FTO layer helped to induce the crystal growth of monoclinic WO$_3$.

Figure S2. TEM images of particles scraped from WO$_3$/CuWO$_4$ indicating network morphology of the CuWO$_4$ layer. (a) Network structure of CuWO$_4$ layer; (b) Branched CuWO$_4$ nanoparticles from broken network piece.
Figure S3. Photocurrent comparison of thin film obtained from different runs of dip coating. (Colored lines: Photocurrent under AM 1.5G illumination, Black lines: dark current).

Figure S4. Mott-Schottky plots of WO$_3$/CuWO$_4$ thin film at 10 k (black) and 5 k Hz (red) under dark condition.
Figure S5. Absorption efficiency of: (a) WO\textsubscript{3}/CuWO\textsubscript{4}; (b) WO\textsubscript{3}; and (c) CuWO\textsubscript{4} thin films by measuring the transmission and reflection spectra using an integrating sphere (Absorbance ($\eta_{\text{abs}}$) = 1 − Transmittance − Reflectance).

Figure S6. Linear sweep voltammetry of all samples with (solid lines) and without the illumination of AM 1.5 (dashed lines), measured in 0.5 M Na\textsubscript{2}SO\textsubscript{4} + 0.5 M H\textsubscript{2}O\textsubscript{2} aqueous solution.