

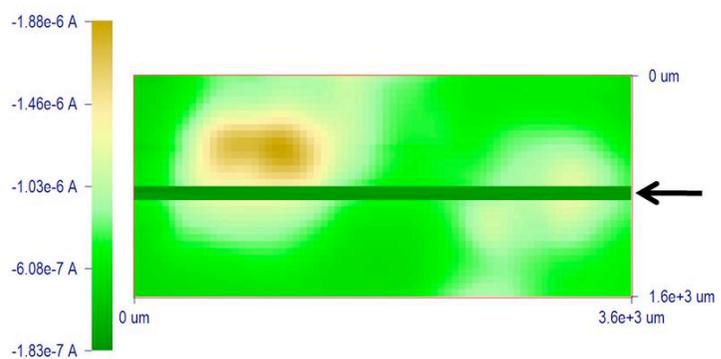
## Supporting Information

### **Screening of Electrocatalysts for Photoelectrochemical Water Oxidation on W-Doped BiVO<sub>4</sub> Photocatalysts by Scanning Electrochemical Microscopy (SECM)**

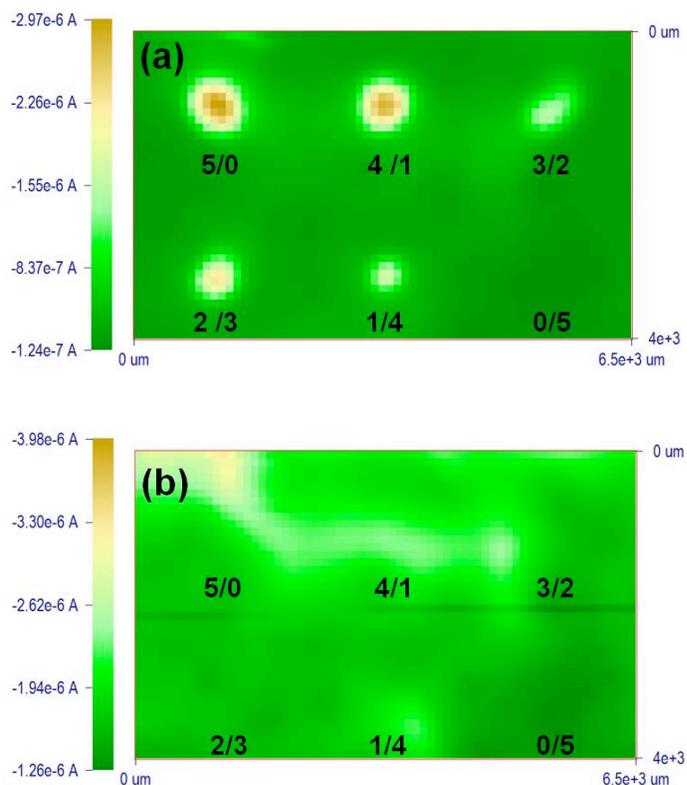
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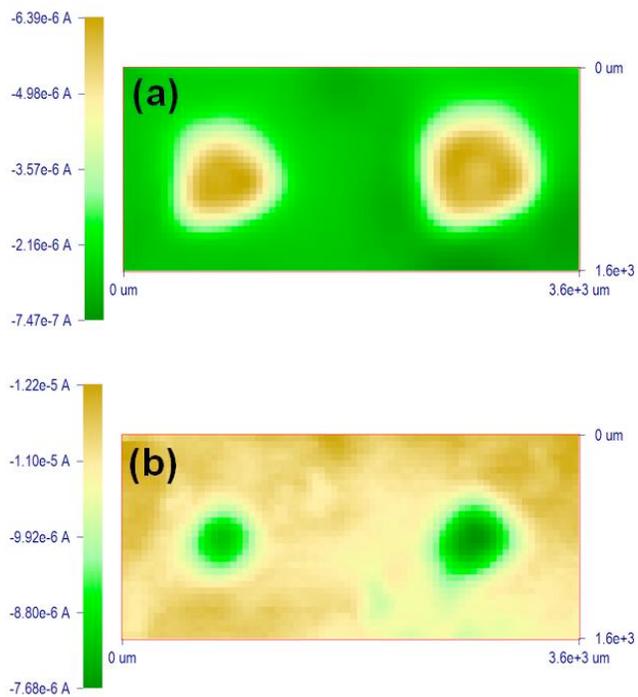
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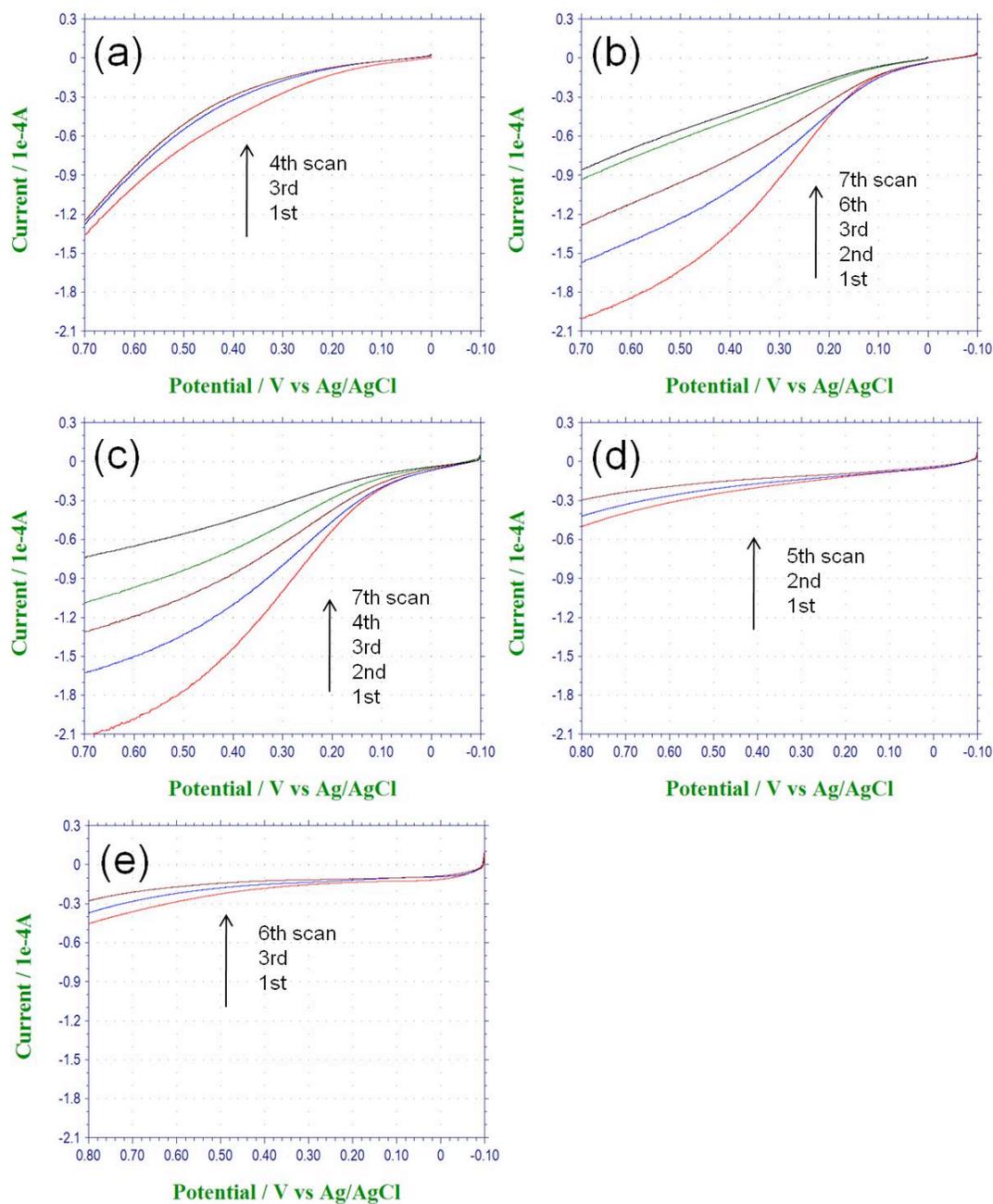
**Figure S1.** SECM image of  $\text{Co}_3\text{O}_4$  spots on the Bi/V/W oxide film at 0.3 V (vs. Ag/AgCl) in 0.2 M sodium phosphate buffer (pH 6.8) under visible light irradiation. Light was blocked during the scan (black arrow).



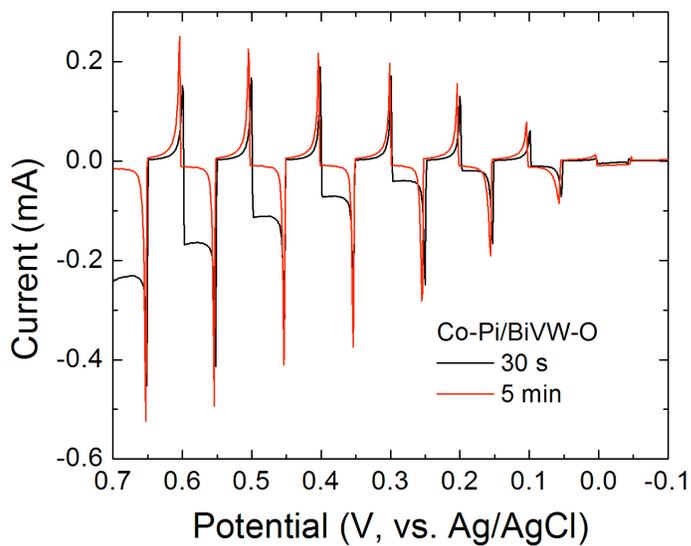
**Figure S2.** SECM images of Co/Ir array on the BiVW-O film (a) at 0.3 V (vs. Ag/AgCl) in 0.2 M sodium phosphate buffer (pH 6.8) only and (b) at 0.1 V (vs. Ag/AgCl) with 0.1 M Na<sub>2</sub>SO<sub>3</sub> as a sacrificial reagent under UV-visible light irradiation. Both images were obtained on exactly same position. Numbers under each spot represent the number of drops of dispensed Co and Ir solutions respectively.



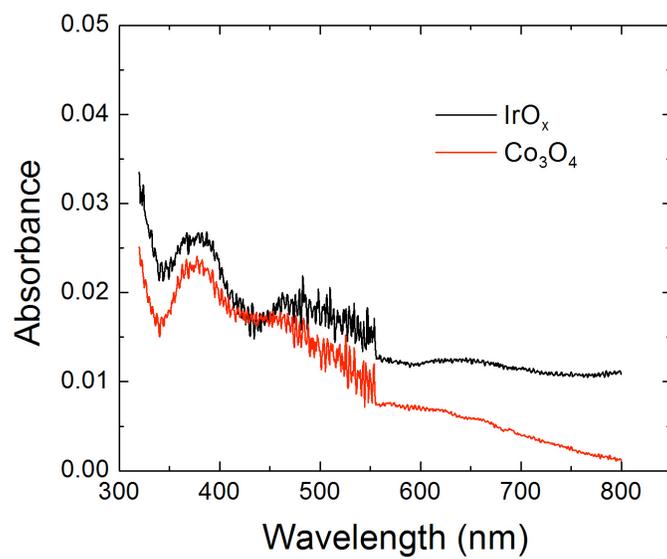
**Figure S3.** SECM images of photoreduced Pt array on the BiVW-O film (a) at 0.3 V (vs. Ag/AgCl) in 0.2 M sodium phosphate buffer (pH 6.8) only and (b) at 0.2 V (vs. Ag/AgCl) with 0.1 M  $\text{Na}_2\text{SO}_3$  as a sacrificial reagent under UV-visible light irradiation.



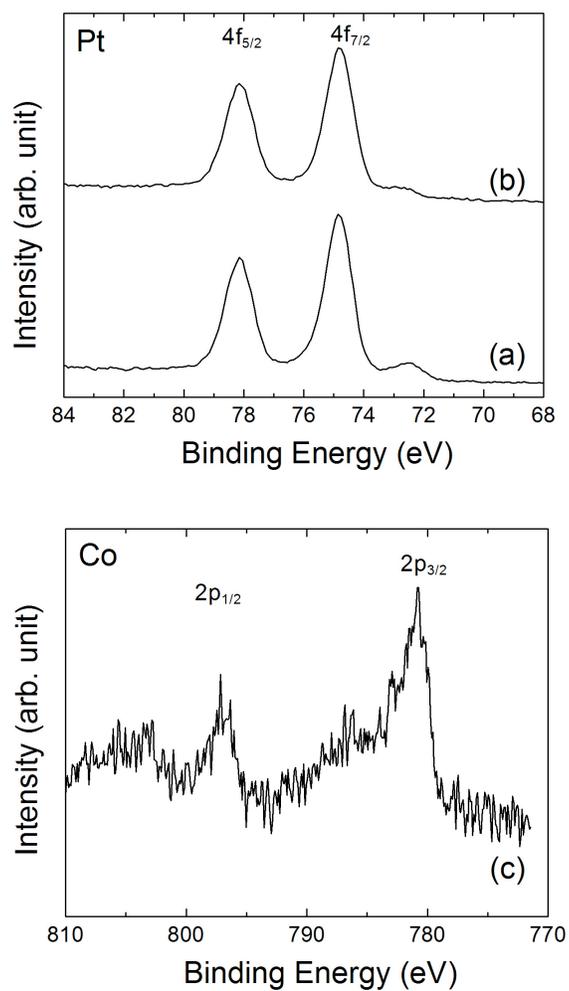
**Figure S4.** Linear sweep voltammograms of Ir/BiVW-O films in 0.2 M sodium phosphate buffer (pH 6.8) under UV-visible irradiation. Atomic percentage of Ir is (a) 0.2 %, (b) 0.5 %, (c) 1 %, (d) 5 %, and (e) 10 % compared to total atomic amount of Bi, V, and W. Each figure shows multiple voltammograms showing decreasing current with more scans. Scan rate: 20 mV/s. Electrode area: 0.2 cm<sup>2</sup>.



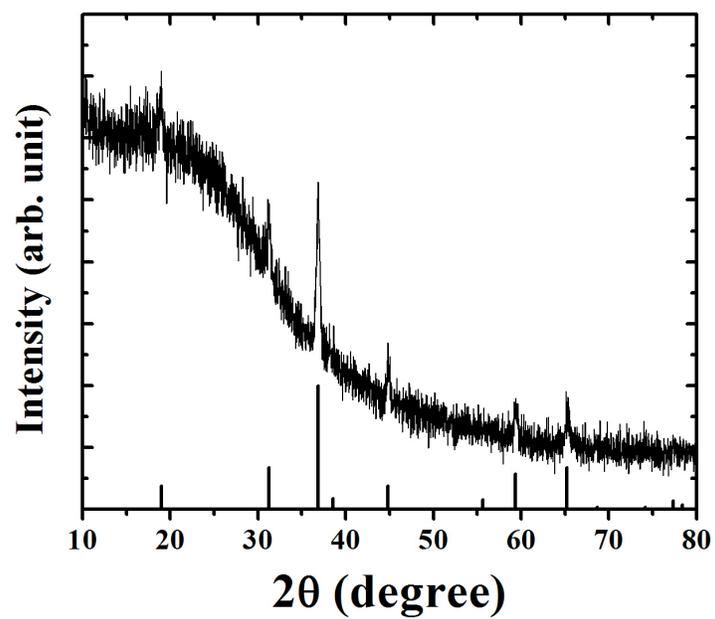
**Figure S5.** Linear sweep voltammograms of Co-Pi/BiVW-O films with 30 s and 5 min Co-Pi deposition in 0.2 M sodium phosphate buffer (pH 6.8) under UV-visible light irradiation. Scan rate: 20 mV/s. The concentration of  $\text{Co}(\text{NO}_3)_2$  in the Co-Pi deposition process was 0.5 mM which is 10 times higher than that used for Figure 7 in the manuscript. Electrode area:  $0.2 \text{ cm}^2$ .



**Figure S6.** UV-vis spectra of IrO<sub>x</sub> and Co<sub>3</sub>O<sub>4</sub> films on FTO. 50  $\mu$ L of each precursor solution (1 mM) was used to prepare the films. This is equivalent to the amount of Ir and Co in 5 mol % Ir/BiVW-O and Co/BiVW-O films.



**Figure S7.** High resolution XPS spectra of Pt electrocatalysts on BiVW-O film (a) before and (b) after PEC water oxidation experiments and  $\text{Co}_3\text{O}_4$  electrocatalyst on BiVW-O film before PEC water oxidation (c).



**Figure S8.** XRD pattern of  $\text{Co}_3\text{O}_4$  film on glass. Reference  $\text{Co}_3\text{O}_4$  pattern (JCDPS 43-1003) is shown with bar graph below.