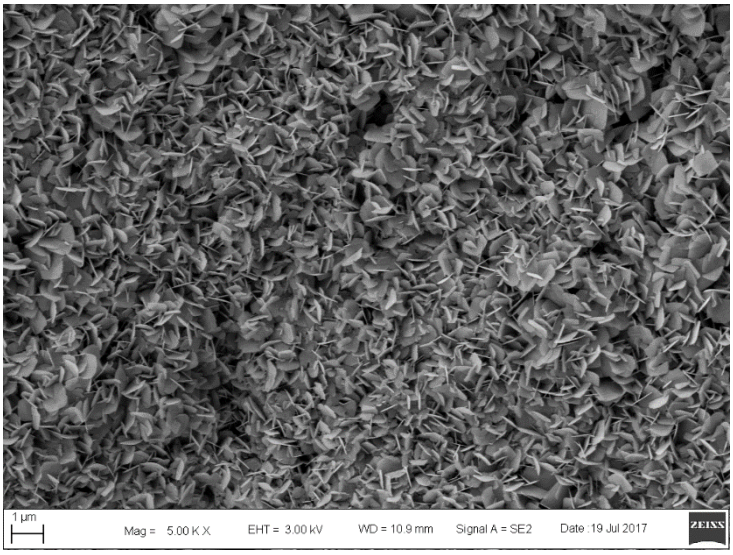
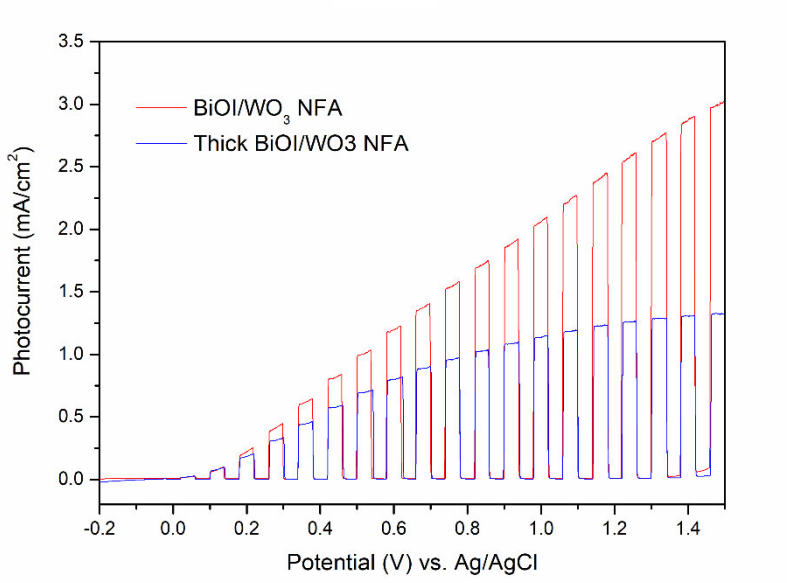
Electronic Supplementary Material



(a)



(b)

Fig. S1 Characterization of thick $BiOI/WO_3$ NFA.

(a) SEM images; (b) photo-response of thick $BiOI/WO_3$ NFA (electrolyte: 0.1 mol/L Na_2SO_4).

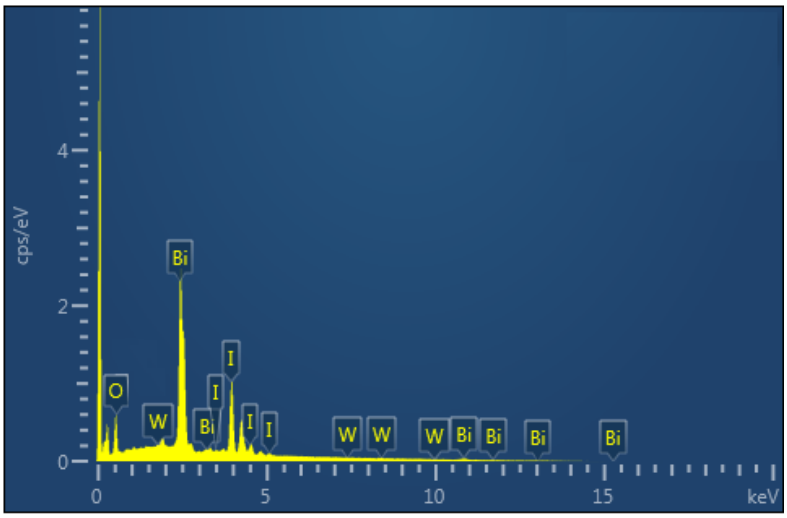


Fig. S2 EDX of BiOI-WO_3 NFA electrode.

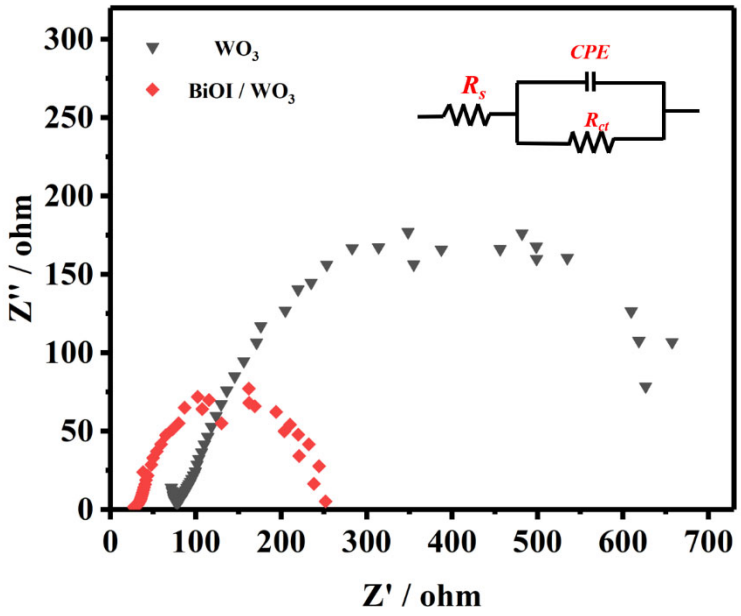


Fig. S3 EIS Nyquist plots of WO_3 and BiOI/WO_3 (The semicircle radii of the EIS Nyquist plot follow the order: r(WO_3) > r(BiOI/WO_3), charactering the decrease of impedance after BiOI modified on WO_3. The inset of Fig. S3 is a Randle equivalent circuit fitted by ZSimpWin, with the systemic series resistance Rs and the interfacial charge transfer resistance Rct. The Rct of BiOI/WO_3 is 227.4 Ω smaller than that of WO_3 (661.8 Ω), indicating that the lower interfacial charge transfer resistance of BiOI/WO_3.).

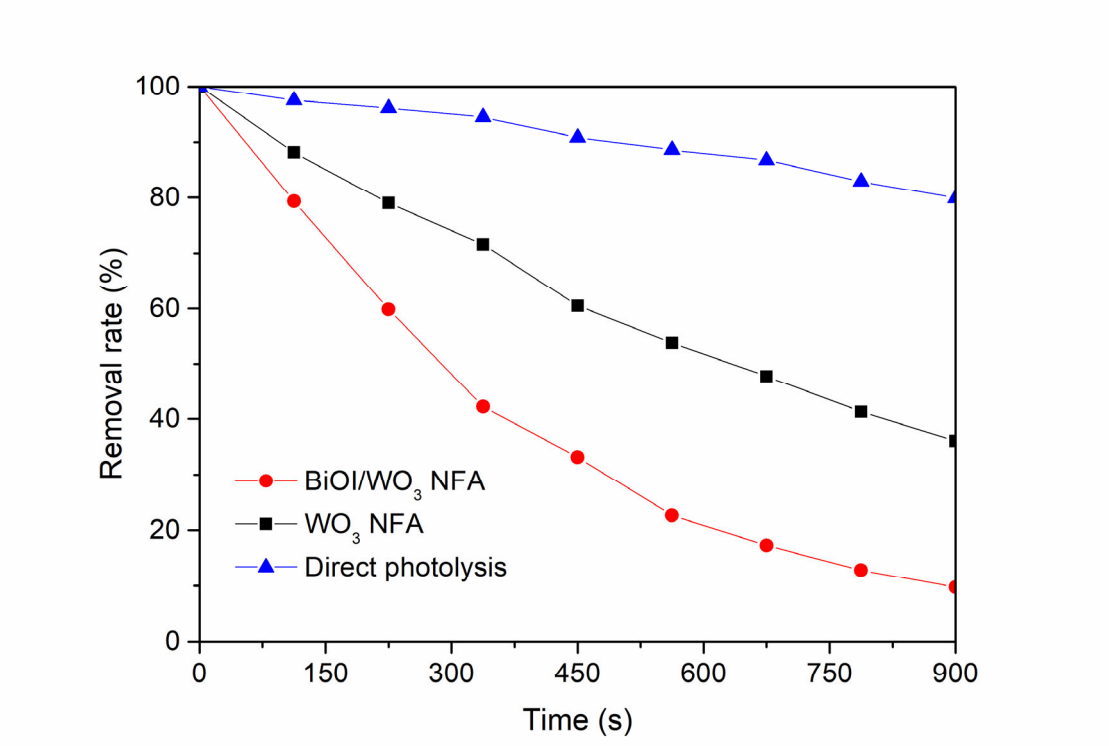
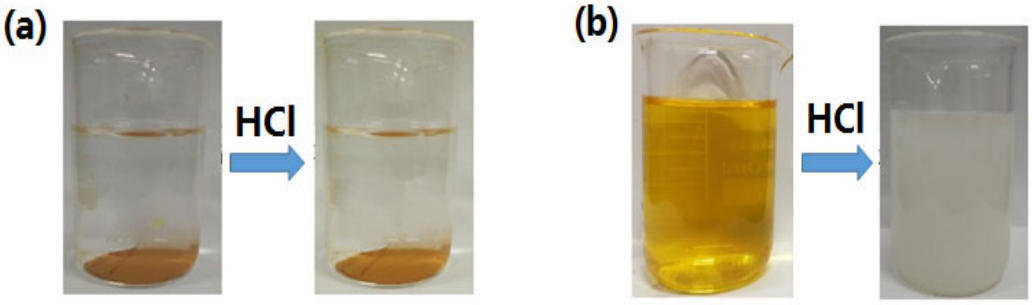


Fig. S4 PEC degradation of methylene blue (MB) using direct photolysis, WO_3 and $BiOI/WO_3$ NFA (The PEC degradation of the methylene blue (MB) experiment was conducted under AM 1.5 irradiation, vigorous stirring, 1.0 V (versus Ag/AgCl) of electric bias, pH 7, and 0.1 mol/L Na_2SO_4 as supporting electrolyte. The initial concentration of the MB solution was 5 mg/L and the reaction solution was 15 mL during the experiment. The degradation rate of the dyes was analyzed with an UV-Vis spectrophotometer (UV2102 PCS, UNICO, Shanghai)).



(a) (b)

Fig. S5 Qualitative analysis of polysulfide.

(a) Clarifying solution obtained after S separated with 0.5 mol/L H_2SO_4 and 0.2 mol/L KI as anode solution (The solution remained unchanged when HCl was added.); (b) yellow clarifying polysulfide (S_x^{n-}) solution obtained in the controlled trial with 0.5

mol/L H_2SO_4 in the anode chamber without I^-/I_3^- (The solution turned to a turbid solution of milky-white.).

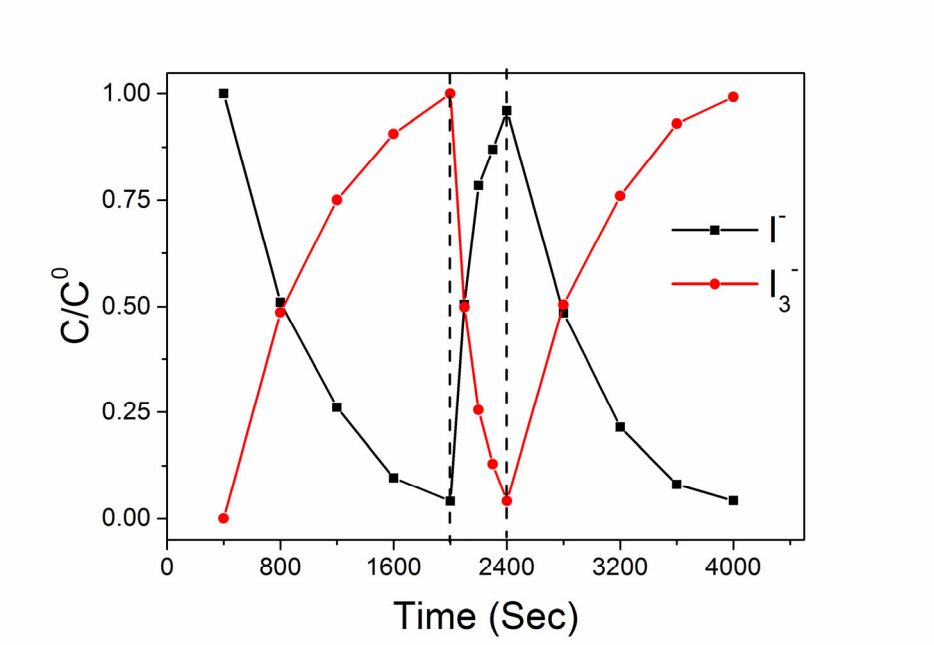


Fig. S6 Ion ratio of I^-/I_3^- during the operation of the system.

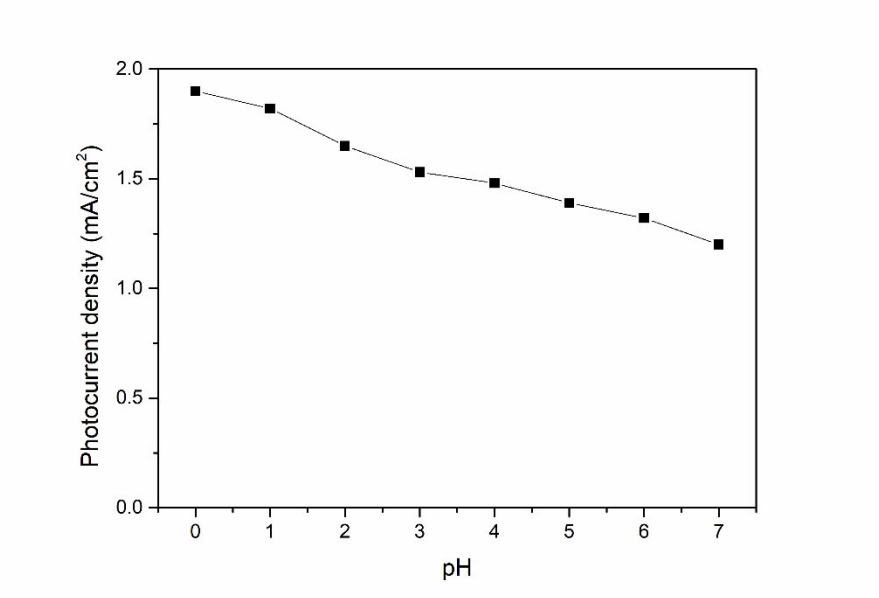


Fig. S7 Effect of pH on the photocurrent (0.2 mol/L KI). (A lower pH led to a higher photocurrent. This is because the redox potential is lower in a more acidic solution. So I^- can be more easily oxidized, and more electrons could be generated and transferred

to the electrode, leading to an increase in the photocurrent. In this work, although pH 0 offers highest photocurrent, pH 1 was finally chose in terms of real condition.).

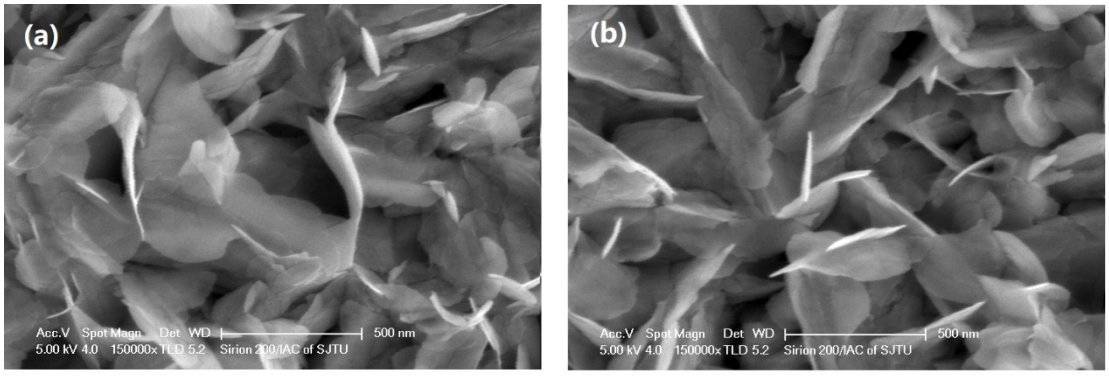


Fig. S8 SEM images of WO_3/BiOI photoanode.

(a) Before long-term use; (b) after long-term use (In the KI solution, the photoanode kept an excellent stability with no significant change in morphology after 7 h of working).