

Solar water oxidation by TaON-BiVO₄ photoanodes functionalized with WO₃

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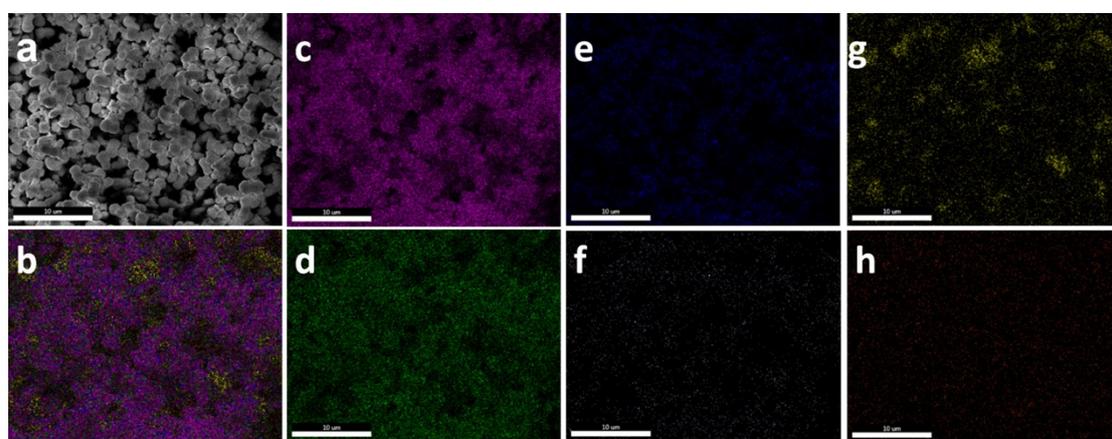


Fig. S1 SEM images (a) and the overlay image (b) of 7W/0.2T-BVO; the corresponding SEM mapping images of (c) Bi (d) V (e) O (f) N (g)Ta (h) W.

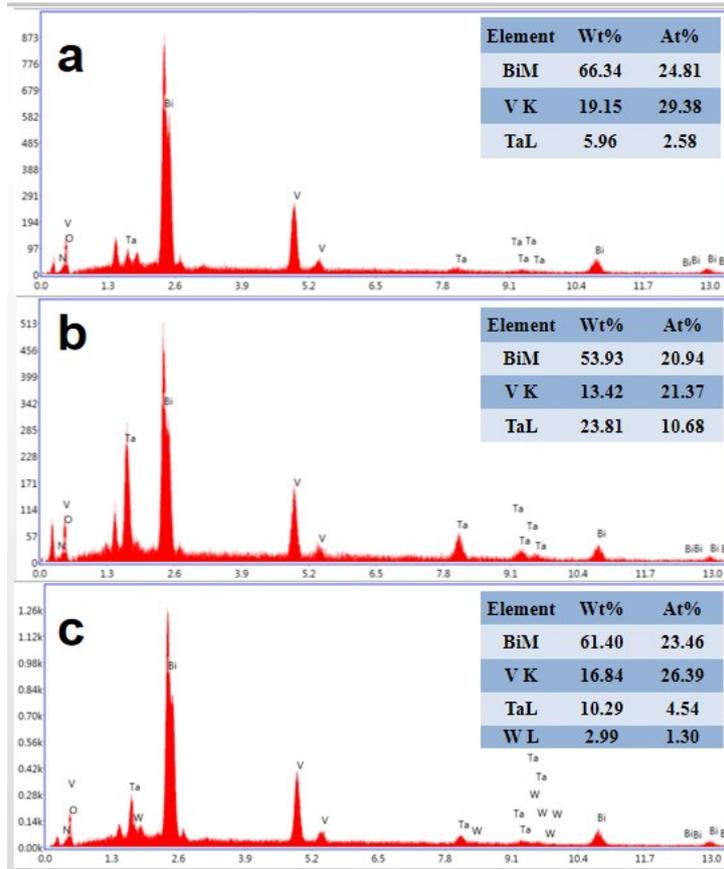


Fig. S2 EDS spectrums of (a) 0.1T-BVO, (b) 0.5T-BVO and 0.2T-BVO/7W. EDS analysis of 0.1T-BVO film shows that the sample contains 24.81 at% of Bi and 2.58 at% of Ta, thus indicating the presence of nearly 10.4% TaON in 0.1T-BVO film. EDS analysis of 0.5T-BVO film and 0.2T-BVO/7W indicate the presence of nearly 51.0% and 19.4% TaON in their composite films, respectively. Among them, 0.2T-BVO/7W film shows that the sample contains 23.46 at% of Bi and 1.30 at% of W, thus indicating the presence of nearly 5.5% WO_3 in 0.2T-BVO/7W film.

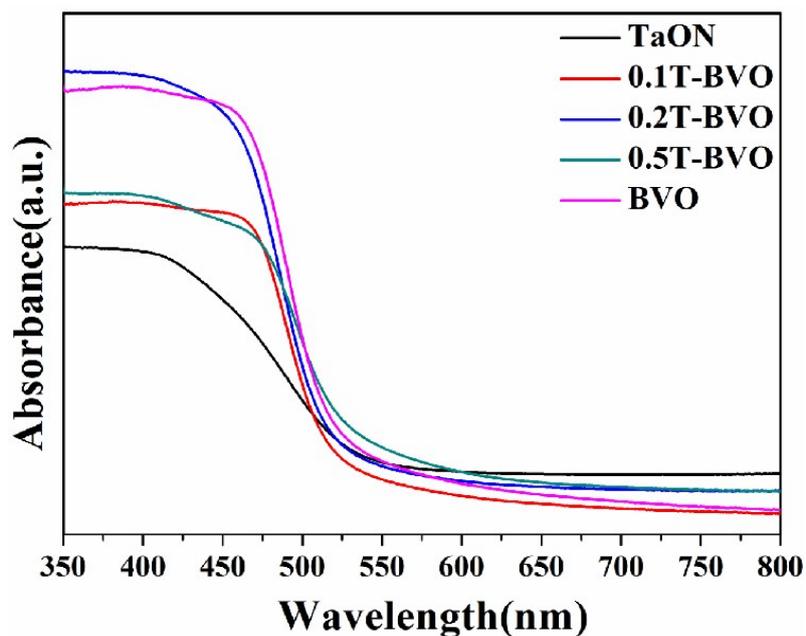


Fig. S3 UV-vis absorption spectra of TaON, BVO and TaON-BVO samples.

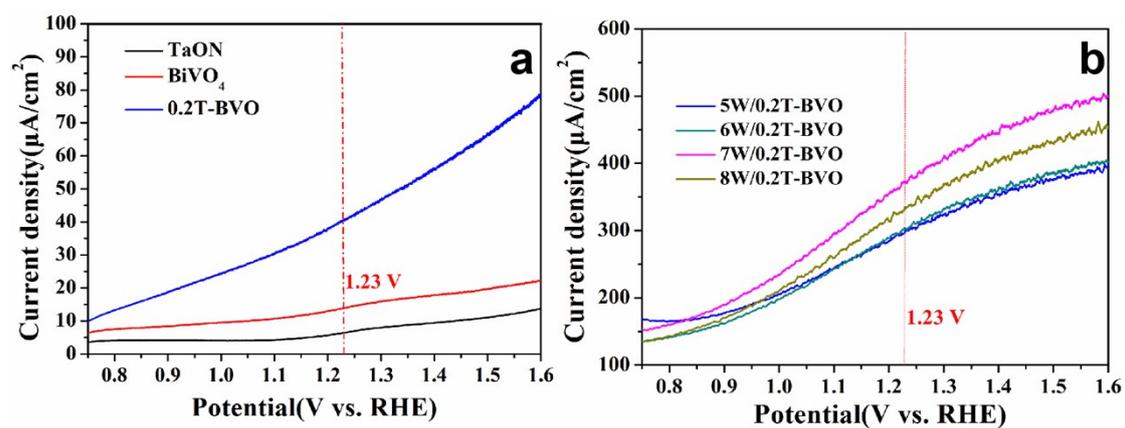


Fig. S4 Linear sweep voltammetry plots of (a) the TaON, BiVO₄ and 0.2T-BVO photoanode, (b) the 0.2T-BVO photoanode with different WO₃ layers measured in 0.1 M sodium borate buffer (pH = 9.2) solution under visible light illumination.

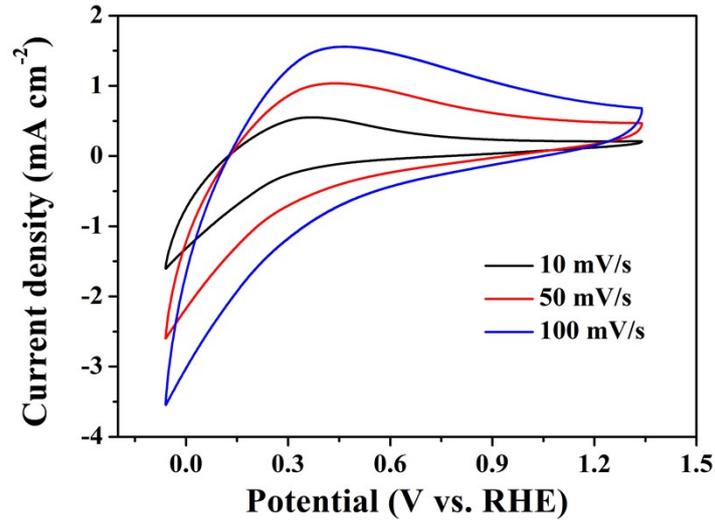


Fig. S5 CV of 0.2T-BVO/WO₃ electrode was carried out at scan rates of 10, 50 and 100 mV/s.

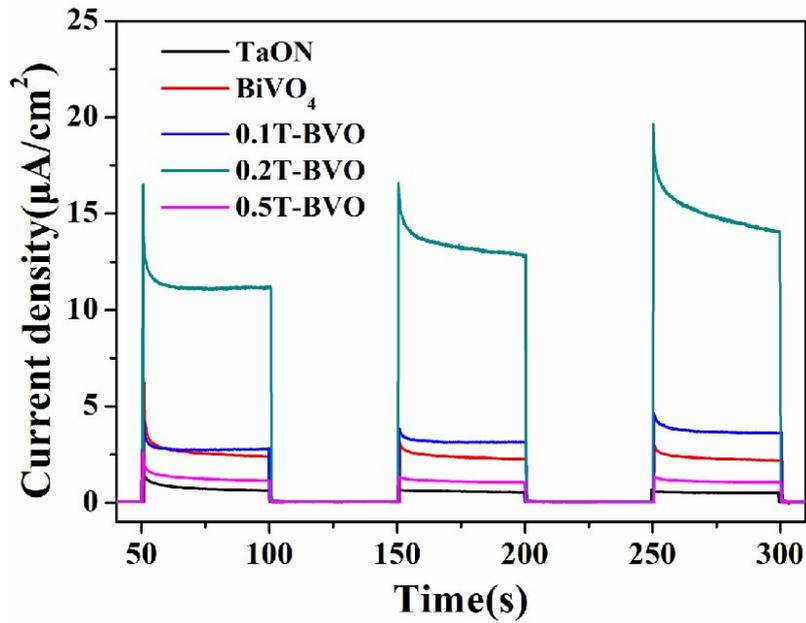


Fig. S6 Transient photocurrent responses of the TaON electrode, the BiVO₄ electrode and different molar ratios of TaON-BVO electrode performed with visible light at 1.0 V (vs. RHE) in 0.1 M sodium borate buffer (pH = 9.2) solution.

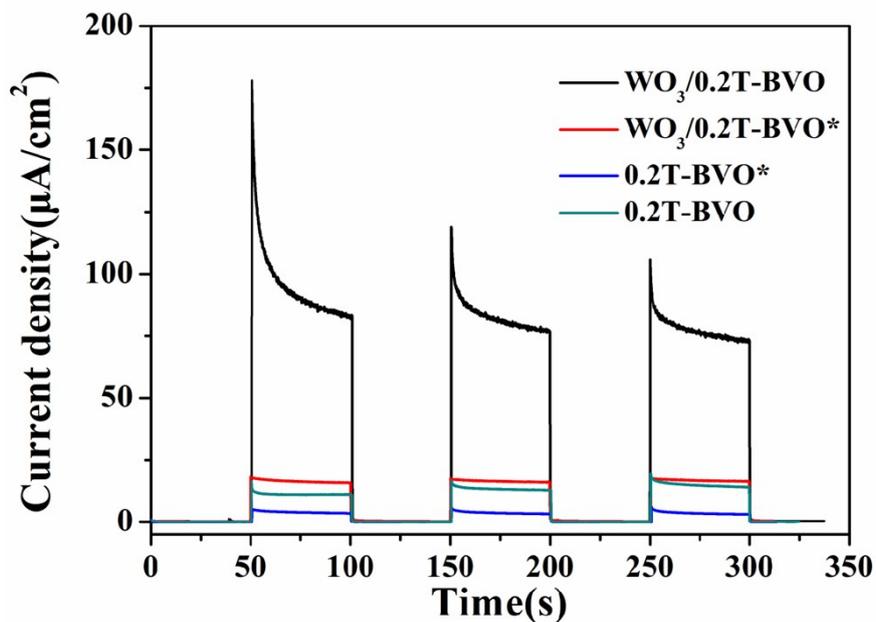


Fig. S7 Transient photocurrent responses of the 0.2T-BVO, 0.2T-BVO*, 0.2T-BVO/WO₃ and 0.2T-BVO*/WO₃ photoanode were performed with visible light at 1.0 V (vs. RHE) in 0.1 M sodium borate buffer (pH = 9.2) solution. (* represents the physical mixing of TaON and BiVO₄)

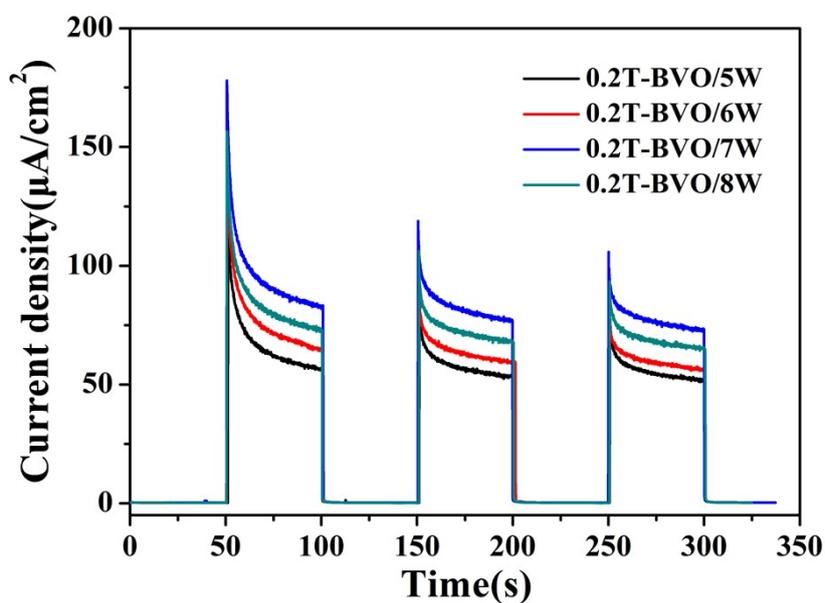


Fig. S8 Transient photocurrent responses of the 0.2T-BVO photoanode with different WO₃ layers performed with visible light at 1.0 V (vs. RHE) in 0.1 M sodium borate buffer (pH = 9.2) solution.

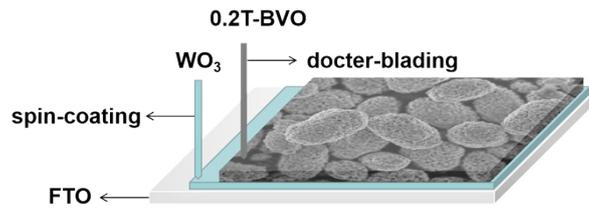


Fig. S9. Schematic illustration of TaON-BiVO₄ electrodes.

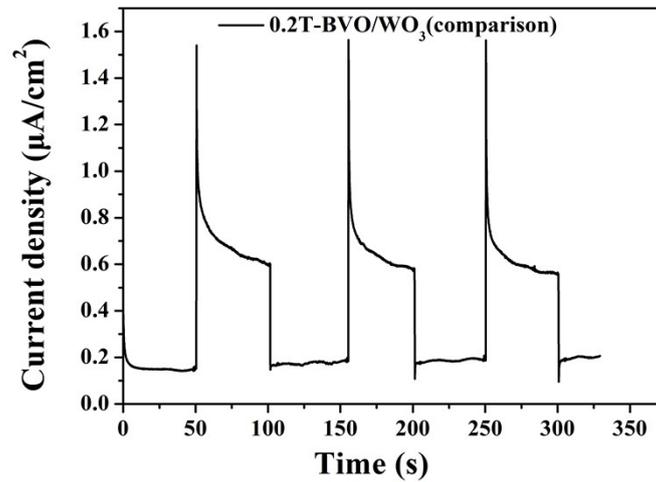


Fig. S10 Transient photocurrent responses of the 0.2T-BVO/WO₃(comparison) layers performed with visible light at 1.0 V (vs. RHE) in 0.1 M sodium borate buffer (pH = 9.2) solution. The WO₃ was synthesized via a simple hydrothermal method.(<https://doi.org/10.1016/j.ijhydene.2018.12.093>)

Table S1 Specific surface area, adsorption average pore diameter and desorption average pore diameter of different samples.

Sample	BET(m ² /g)	BJH Adsorption average pore diameter (nm)	BJH Desorption average pore diameter (nm)
BiVO ₄	2.94	2.09	3.84
TaON	4.93	2.56	3.97
0.2T-BVO	0.63	0.52	1.44

Table S2 R_{ct} of different samples.

Sample	TaON	BiVO ₄	0.1T-BVO	0.2T-BVO	0.5T-BVO
R _{ct} (Ω)	22.38	16.59	15.51	13.11	19.57