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Supporting Information

Preparing a dual-function BiVO₄/NiFe-LDH composite photoanode for enhanced photoelectrocatalytic wastewater treatment and simultaneous hydrogen evolution

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Summary: This document contains 22 pages, including 15 figures, 5 tables and 1 video.

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Table. S1. The corresponding preparation conditions for the different electrodes.

Electrodes	Number of cycles	Calcination temperature
BiVO ₄ /NiFe	15	500 °C
BiVO ₄ /NiFe-10C	10	500 °C
BiVO ₄ /NiFe-15C	15	500 °C
BiVO ₄ /NiFe-20C	20	500 °C
BiVO ₄ /NiFe-non-calcined	15	-
BiVO ₄ /NiFe-300 °C	15	300 °C
BiVO ₄ /NiFe-400 °C	15	400 °C
BiVO ₄ /NiFe-500 °C	15	500 °C
BiVO ₄ /NiFe-600 °C	15	600 °C

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19 **Table. S2.** Reaction kinetic constants and correlation coefficients of different electrodes in PEC
 20 degradation process.

Electrodes	K (min⁻¹)	R²
Ni foam	0.00273	0.991
NiFe-LDH	0.00441	0.963
BiVO ₄ @Ni foam	0.00691	0.992
BiVO ₄ /NiFe;	0.01281	0.985
BiVO ₄ /NiFe-15C;		
BiVO ₄ /NiFe-500 °C		
BiVO ₄ /NiFe-10C	0.00681	0.997
BiVO ₄ /NiFe-20C	0.00845	0.984
BiVO ₄ /NiFe-non-calcined	0.00239	0.993
BiVO ₄ /NiFe-300 °C	0.0032	0.989
BiVO ₄ /NiFe-400 °C	0.0044	0.990
BiVO ₄ /NiFe-600 °C	0.00567	0.993

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31 **Table. S3.** Reaction kinetic constants and correlation coefficients of BiVO₄/NiFe electrode at
32 different voltages in PEC degradation process.

Voltage	K (min ⁻¹)	R ²
0.2 V	0.00549	0.996
0.4 V	0.00838	0.989
0.6 V	0.01281	0.985
0.8 V	0.01688	0.986
1.0 V	0.02062	0.982

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52 **Table. S4.** Reaction kinetic constants and correlation coefficients of BiVO₄/NiFe electrode at
53 different pH in PEC degradation process.

pH	K (min⁻¹)	R²
5.5	0.01095	0.991
6.5	0.02528	0.961
7.5	0.01281	0.985
8.5	0.00676	0.981
9.5	0.00891	0.975

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67 **Table. S5.** Reaction kinetic constants and correlation coefficients of BiVO₄/NiFe electrode in

68 different degradation processes.

Process	K (min⁻¹)	R²
Photolysis	0.00045	0.976
Dark adsorption	0.00049	0.973
PC	0.00202	0.994
PEC	0.01281	0.985
EC	0.00217	0.976

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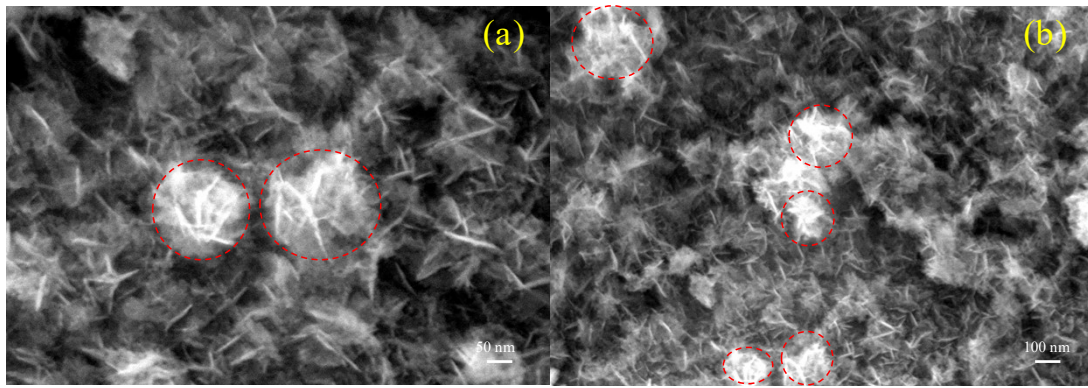
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Fig. S1. SEM images of BiVO₄/NiFe electrode after PEC process.

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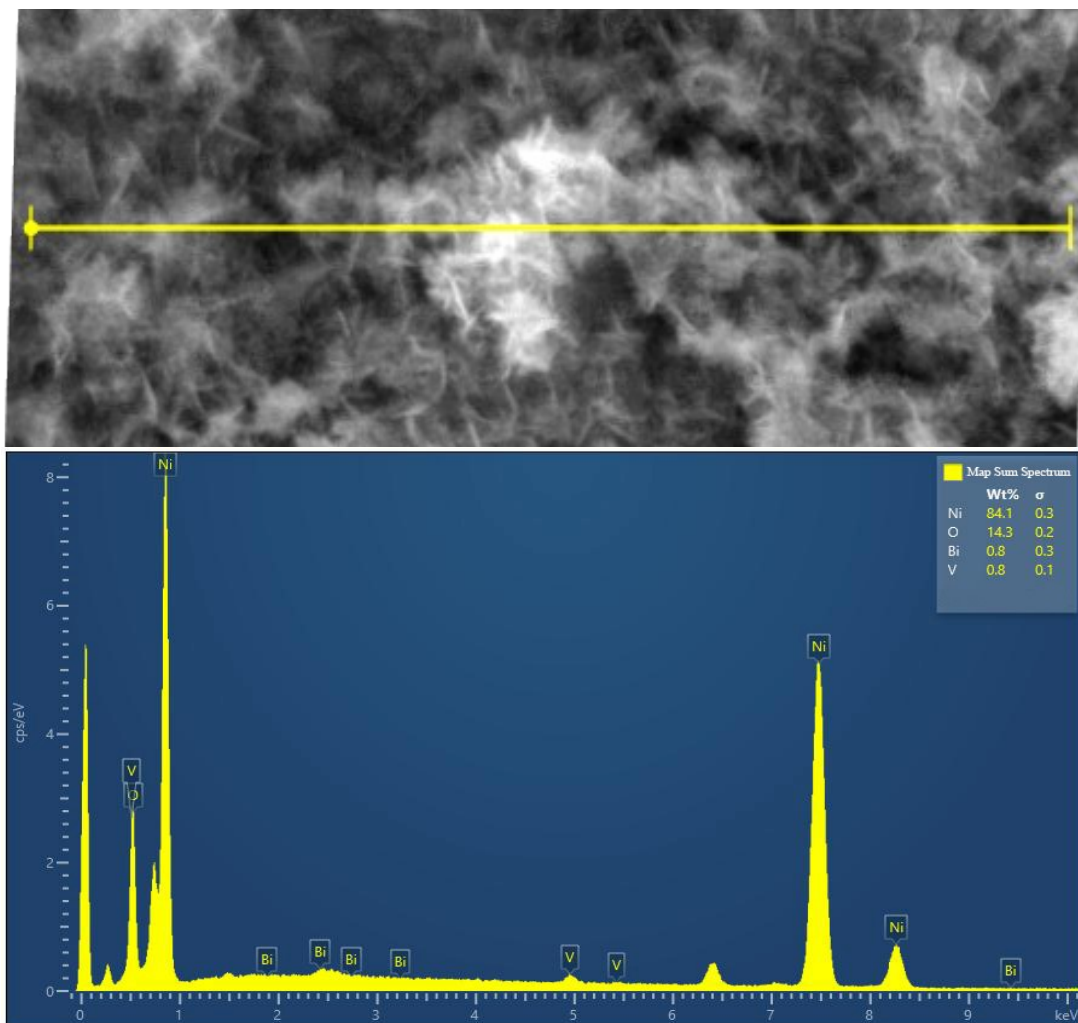
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Fig. S2. The EDS line scanning of BiVO₄/NiFe electrode.

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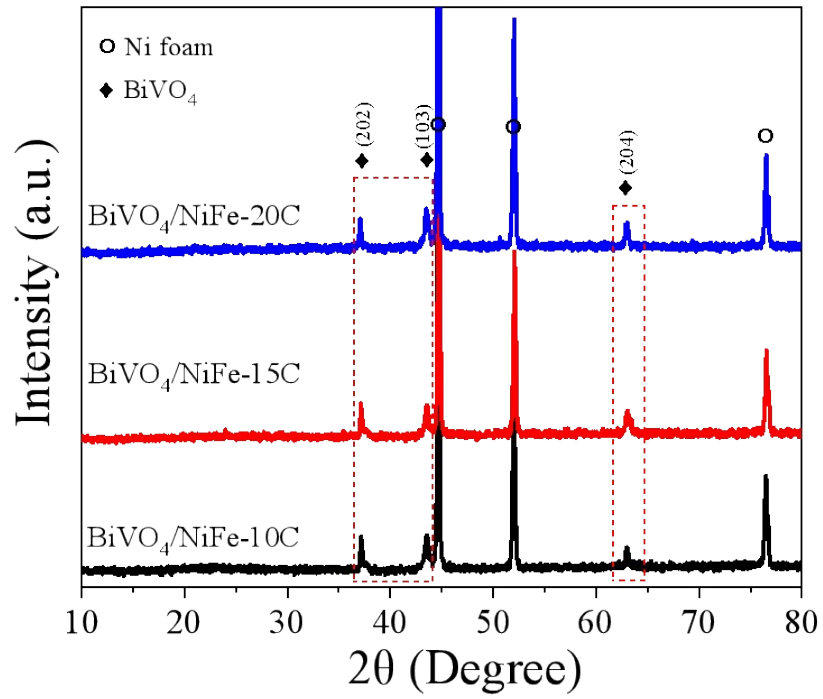
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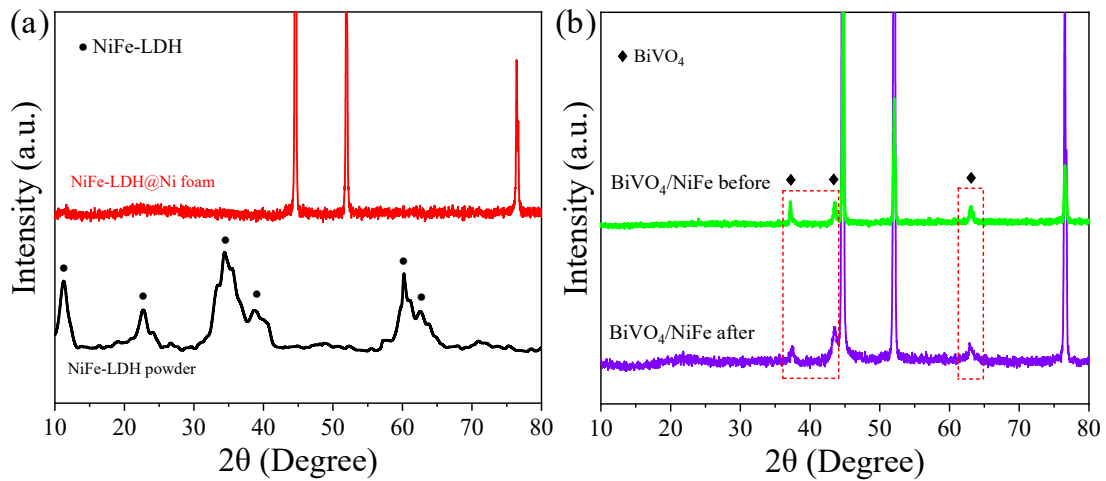
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Fig. S3. XRD patterns of BiVO₄/NiFe electrodes prepared under different cycles.

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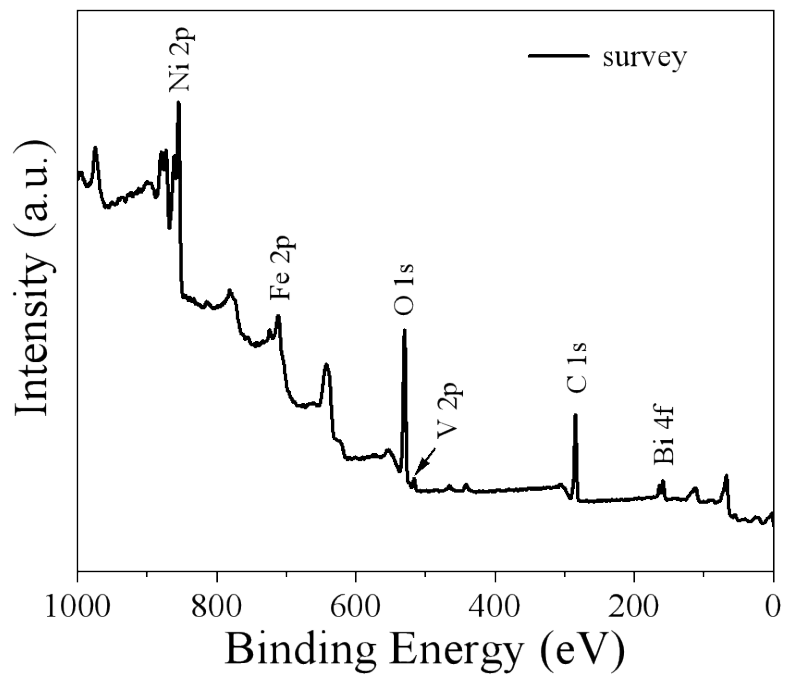
116 **Fig. S4.** XRD patterns of (a) NiFe-LDH@Ni foam and NiFe-LDH powder; (b) BiVO₄/NiFe

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electrode before use and BiVO₄/NiFe electrode after use.

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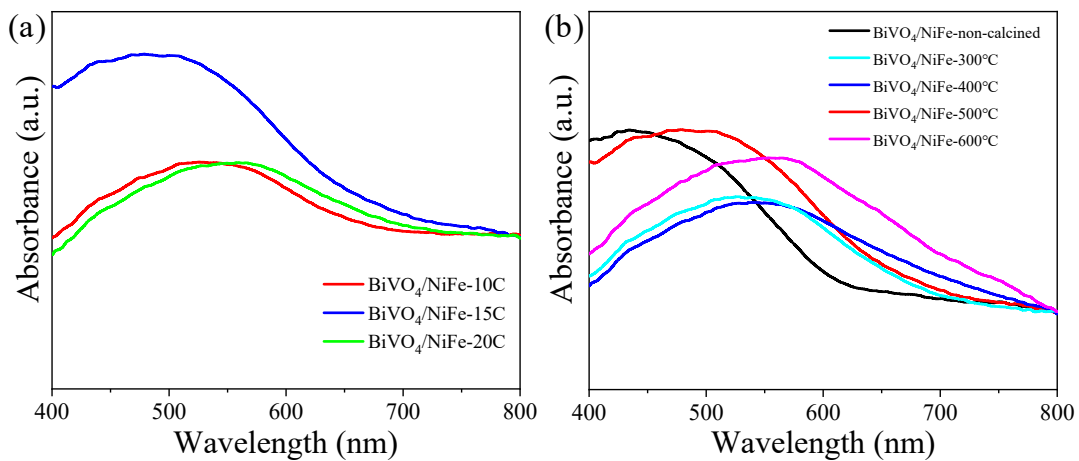
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Fig. S5. XPS survey spectrum of BiVO₄/NiFe electrode.



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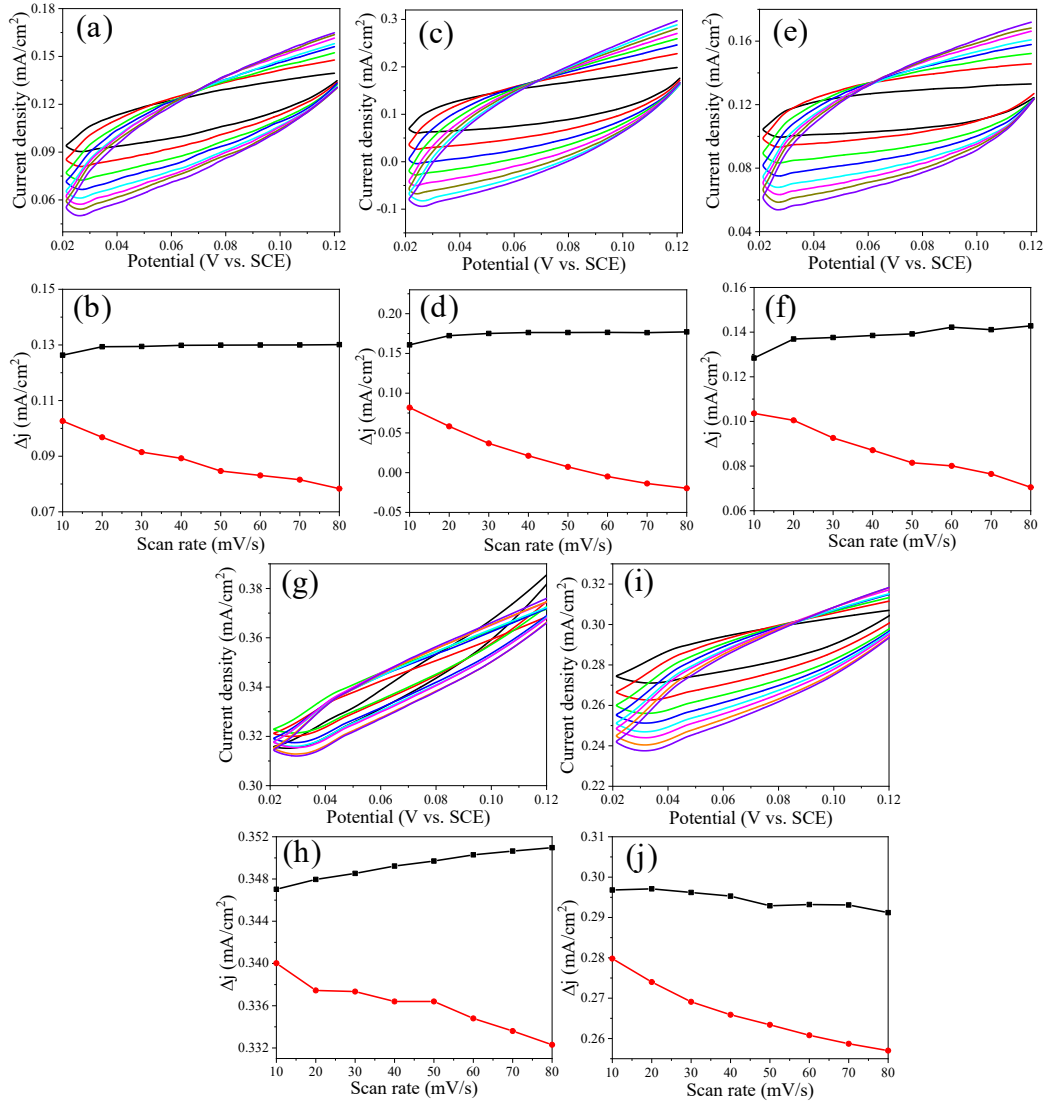
125 **Fig. S6.** UV-vis DRS spectra of BiVO₄/NiFe electrodes prepared under (a) different cycles and (b)

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different calcination temperature.

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130 **Fig. S7.** CV curves and corresponding current density diagram at 0.07 V (vs. SCE) of different

131 samples: (a-b) BiVO₄/NiFe-10C, (c-d) BiVO₄/NiFe-15C, (e-f) BiVO₄/NiFe-20C, (g-h) NiFe-LDH,

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(i-j) BiVO₄@Ni foam.

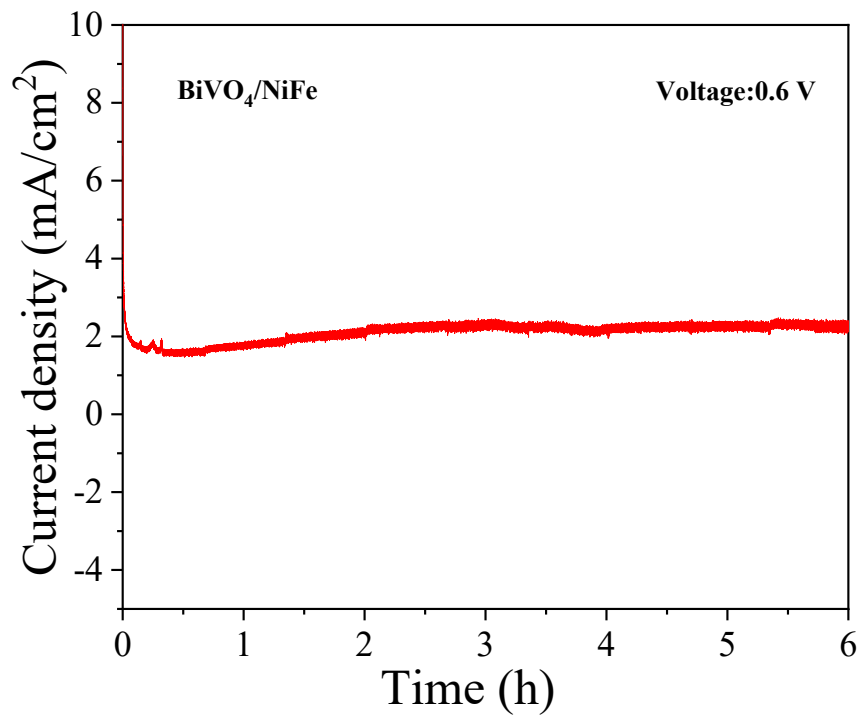
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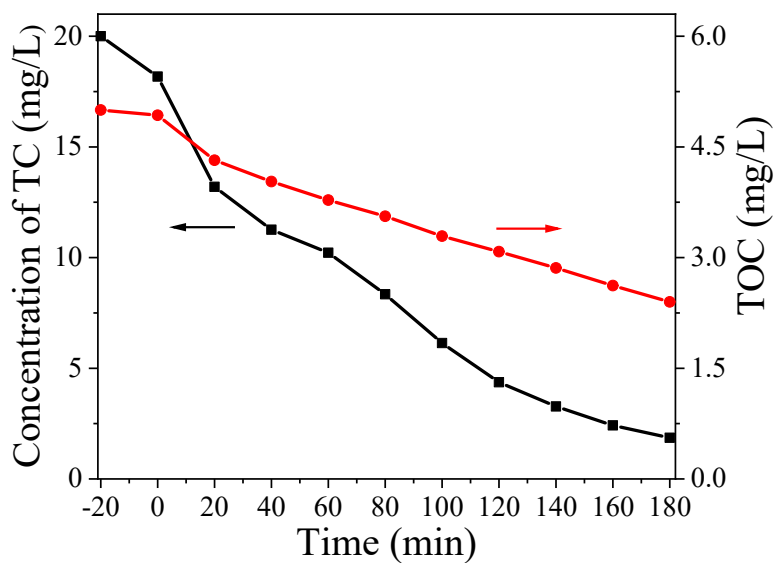
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139 **Fig. S8.** Chronocurrent curve of BiVO₄/NiFe electrode under visible light irradiation at 0.6 V (vs.

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SCE) in 6 h.

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144 **Fig. S9.** TC concentration and TOC removal during PEC degradation using BiVO₄/NiFe electrode.

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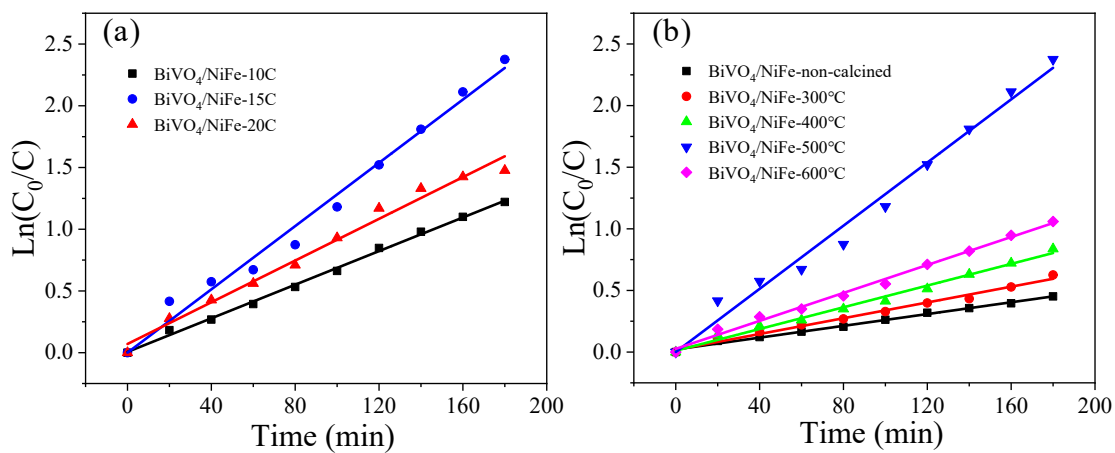
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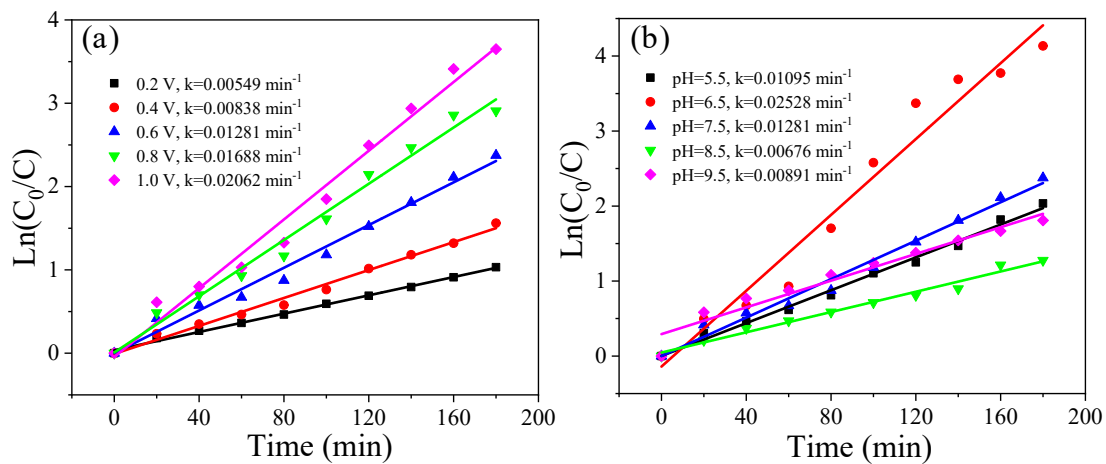
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155 **Fig. S10.** The degradation kinetic plots of BiVO₄/NiFe electrodes prepared under (a) different

156 cycles and (b) different calcination temperature.

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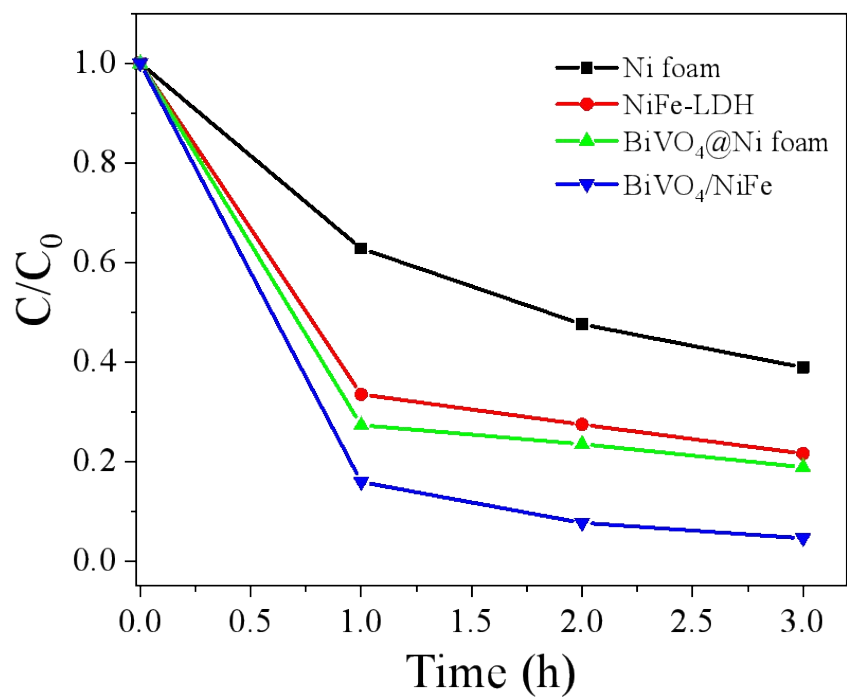
160 **Fig. S11.** The degradation kinetic plots of BiVO₄/NiFe electrode under (a) different voltage and (b)

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different pH.

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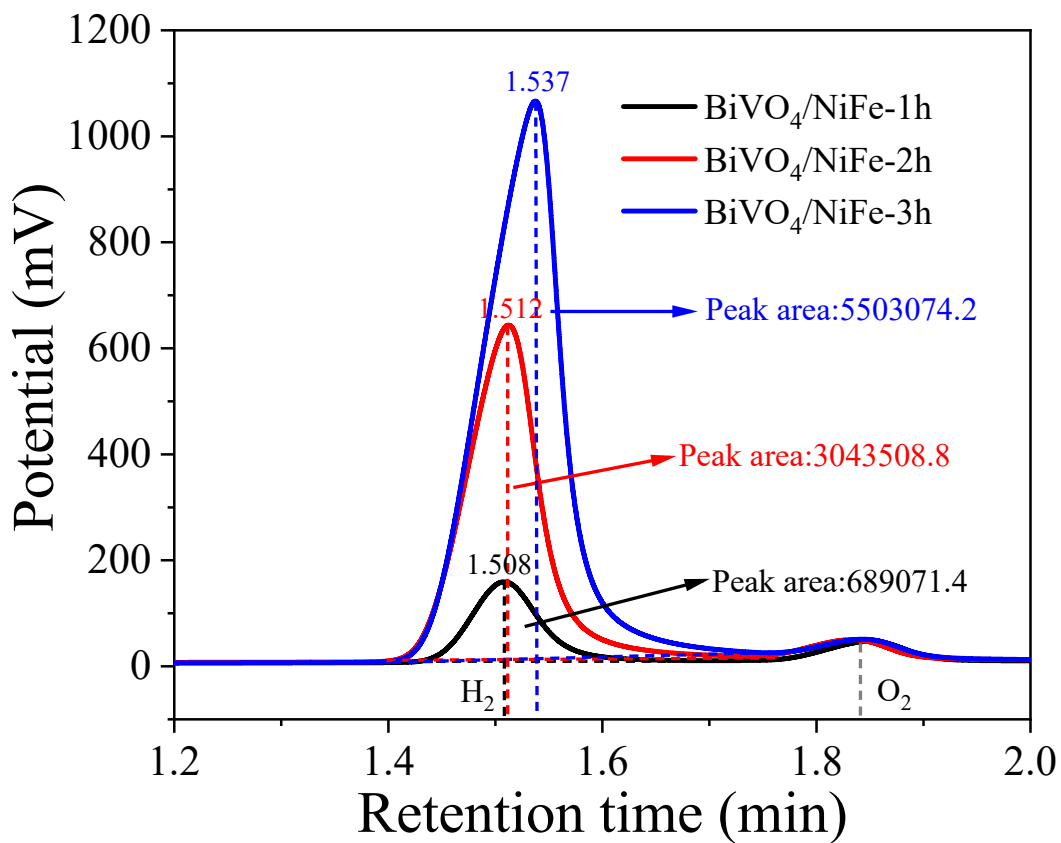
165 **Fig. S12.** The TC degradation efficiency of different samples during the PEC hydrogen evolution

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process.

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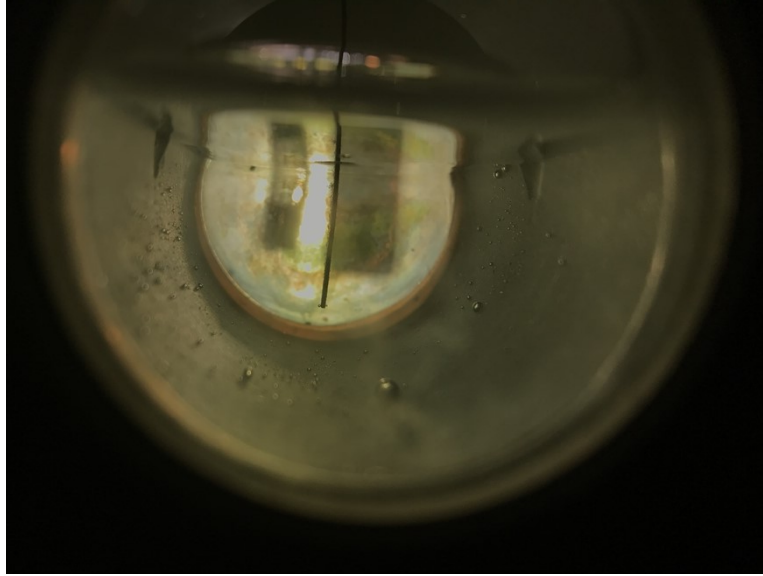
170 **Fig. S13.** GC spectra of hydrogen evolved at cathode in the PEC process using BiVO₄/NiFe

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photoanode.

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Fig. S14. The actual picture of hydrogen evolution in the PEC process.

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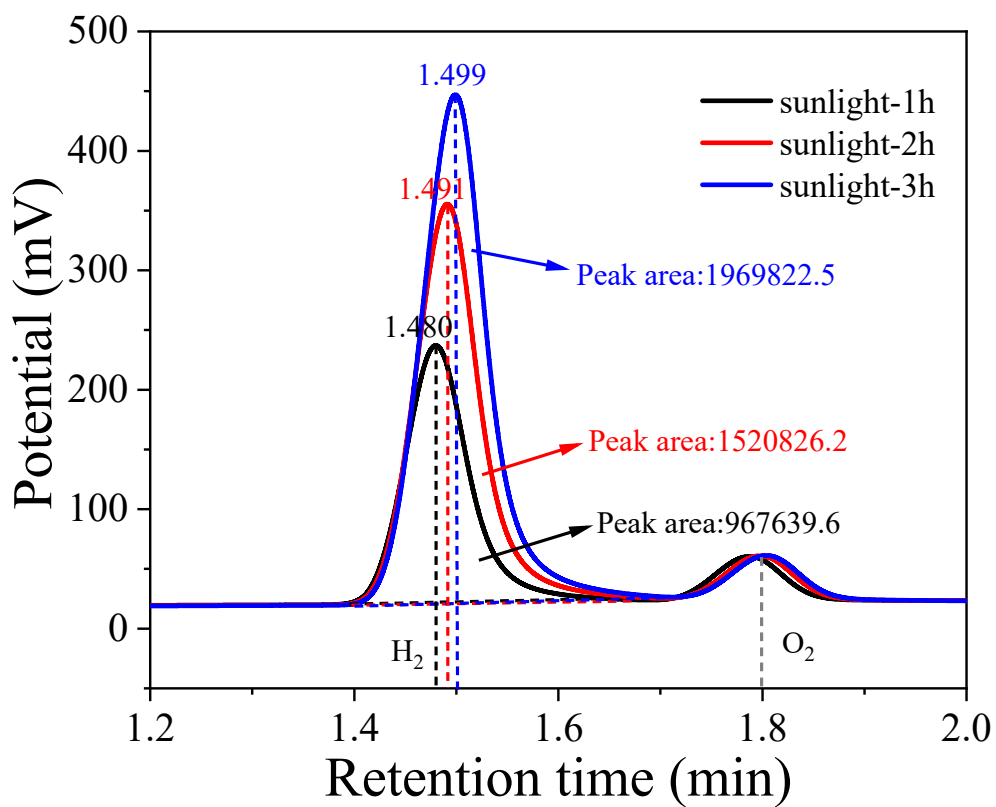
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Fig. S15. The video of hydrogen evolution under sunlight irradiation.

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183 **Fig. S16.** GC spectra of hydrogen evolved at cathode under sunlight irradiation using BiVO₄/NiFe

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photoanode.

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