

Supplementary Materials

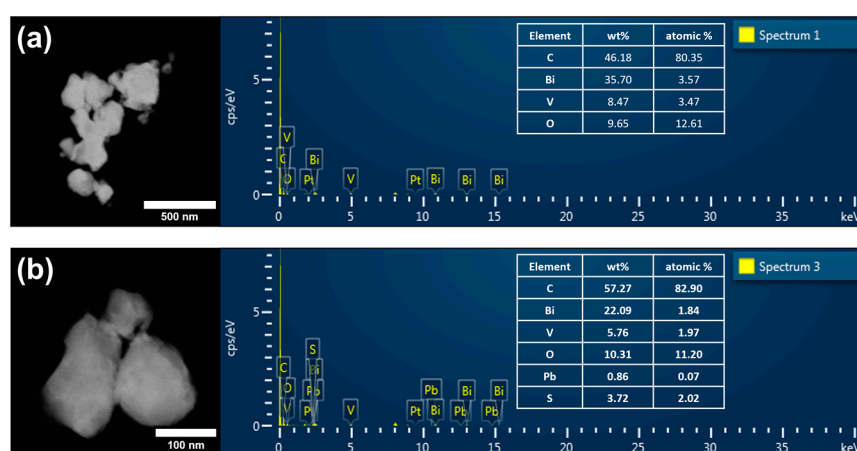
# PbS Quantum Dots Decorated BiVO<sub>4</sub> Photoanodes for Highly Efficient Photoelectrochemical Hydrogen Production

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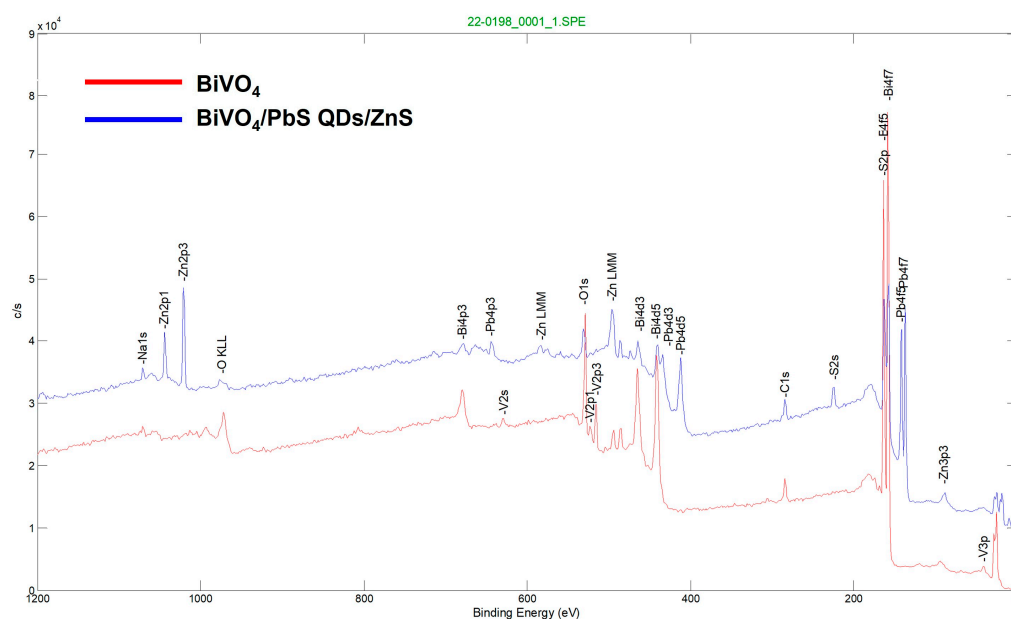
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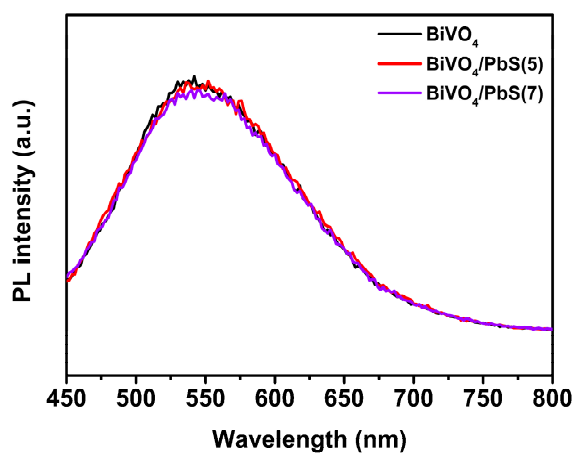
<sup>†</sup> These authors contributed equally to this work.



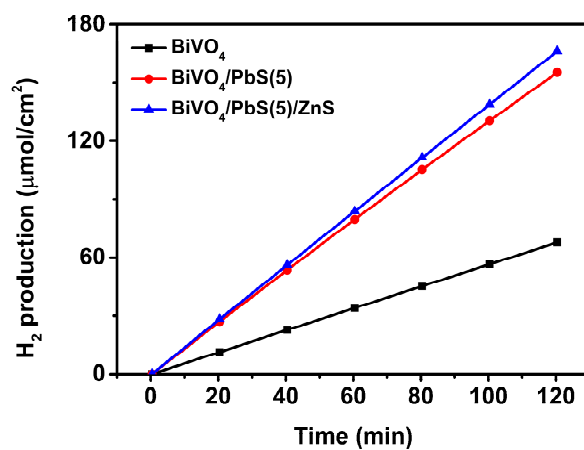
**Figure S1.** TEM images and relevant EDX spectra of each element with the relative concentration for (a) bare BiVO<sub>4</sub> and (b) BiVO<sub>4</sub>/PbS QDs.



**Figure S2.** Survey XPS scans of bare BiVO<sub>4</sub> and BiVO<sub>4</sub>/PbS QDs/ZnS films.



**Figure S3.** Steady-state PL spectra of bare  $\text{BiVO}_4$  and  $\text{BiVO}_4/\text{PbS}(n)$  QDs films ( $n$ : the number of PbS SILAR cycles).



**Figure S4.** Calculated theoretical hydrogen production of bare  $\text{BiVO}_4$ ,  $\text{BiVO}_4/\text{PbS}(5)$  QDs, and  $\text{BiVO}_4/\text{PbS}(5)$  QDs/ZnS photoanodes, based on chronoamperometric curves (at  $1.23 \text{ V}_{\text{RHE}}$ ).

**Table S1.** Previously reported performances of BiVO<sub>4</sub> photoelectrodes for PEC hydrogen production.

Photoelectrode	Electrolyte conditions	Photocurrent density (mA/cm <sup>2</sup> )	Retention of photocurrent	Reference
BiVO <sub>4</sub> /NiFeO <sub>x</sub>	1.0 M borate buffer (pH = 9.5)	6.24 (at 1.23 V vs. RHE)	~100 % (after 80 h)	[14]
TiO <sub>2-x</sub> /BiVO <sub>4</sub>	0.5 M KPi buffer (pH = 7)	6.12 (at 1.23 V vs. RHE)	~ 83 % (after 100 h)	[15]
Mo-BiVO <sub>4</sub> /B-C <sub>3</sub> N <sub>4</sub> /NiFeO <sub>x</sub>	potassium phosphate buffer with 0.5 M Na <sub>2</sub> SO <sub>3</sub> (pH=7)	~6 (at 1.23 V vs. RHE)	92% (after 10 h)	[52]
BiVO <sub>4</sub> /FeOOH/NiOOH	1.0 M potassium borate with 0.2 M Na <sub>2</sub> SO <sub>3</sub> (pH = 9.5)	5.87 (at 1.23 V vs. RHE)	~ 97 % (after 10 h)	[53]
BiVO <sub>4</sub> /FeOOH	0.5 M borate buffer (pH = 9.5)	4.71 (at 1.23 V vs. RHE)	~ 100 % (after 11 h)	[54]
Ar plasma treated BiVO <sub>4</sub>	potassium phosphate buffer with 1.0 M Na <sub>2</sub> SO <sub>3</sub> (pH=7)	4.32 (at 1.23 V vs. RHE)	~ 100% (after 45h)	[55]
BiVO <sub>4</sub> /Co(salophen)	0.1 M phosphate buffer (pH=7)	4.27 (at 1.23 V vs. RHE)	~ 100 % (after 3h)	[56]
BiVO <sub>4</sub> /FeOOH/NiOOH	0.5 M phosphate buffer (pH=7)	4.2 (at 1.23 V vs. RHE)	~ 100 % (after 48h)	[11]
BiVO <sub>4</sub> /PbS/ZnS	0.5 M KH <sub>2</sub> PO <sub>4</sub> with 1.0 M Na <sub>2</sub> SO <sub>3</sub> (pH = 7)	5.19 (at 1.23 V vs. RHE)	~ 97 % (after 2h)	<u>This work</u>