

Electronic Supplementary Information

Synthesis of cadmium sulfide quantum dot-decorated barium stannate nanowires for photoelectrochemical water splitting

Zemin Zhang,^{‡a} Xiaodong Li,^{‡b} Caitian Gao,^a Feng Teng,^a Youqing Wang,^a Lulu Chen,^a
Weihua Han,^{*a} Zhenxing Zhang^a and Erqing Xie^{*a}

^a *School of Physical Science and Technology, Lanzhou University, Lanzhou 730000, China.*

^b *Institute of Chemical Materials, China Academy of Engineering Physics, Mianyang 621900, China.*

[‡] These authors contributed equally to this work.

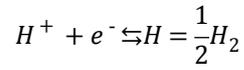
* Corresponding Author.

E-mail: hanwh@lzu.edu.cn (Weihua Han); xieeq@lzu.edu.cn (Erqing Xie).

Fax: (+86) 931 8913554; Tel: (+86) 931 8912616.

Formula derivation:

The hydrogen evolution reaction on the counter electrode can be described as follow:



The molar concentration of photo-generated electrons:

$$n_e = \frac{Q}{eN_A t} = \frac{j}{eN_A} (\mu\text{mol}/(\text{s cm}^2))$$

Where Q is the surface charge density, j is the current density (mA cm^{-2}) and N_A is the Avogadro constant.

The molar concentration of Hydrogen atoms:

$$n_H = \eta_F n_e = \frac{j \eta_F}{eN_A}$$

η_F is the faradaic efficiency for hydrogen evolution.

The molar concentration of generated hydrogen:

$$n_{H_2} = \frac{1}{2}n_H = \frac{1j \eta_F}{2eN_A} = \frac{1800 \times j \times \eta_F}{e \times N_A} (\mu\text{mol}/(\text{h cm}^2))$$

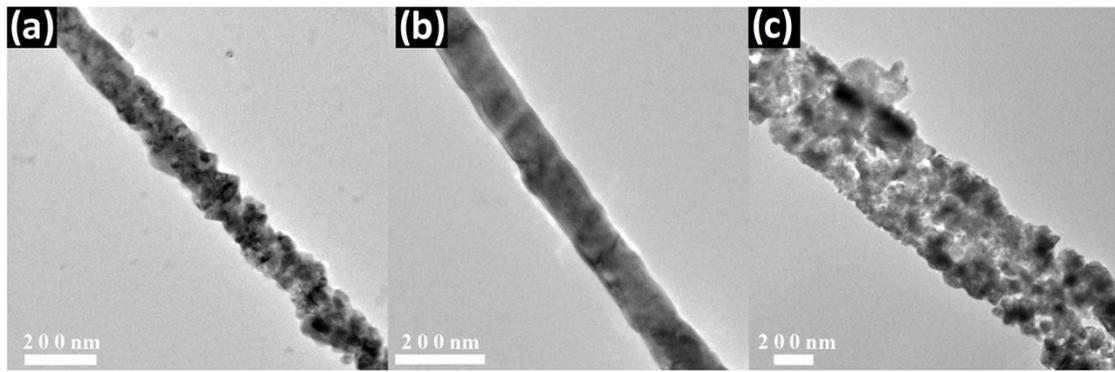


Fig.S1 The morphological change of the nanowires as PVP content varied (a) 9%, (b) 11% and (c) 13%.

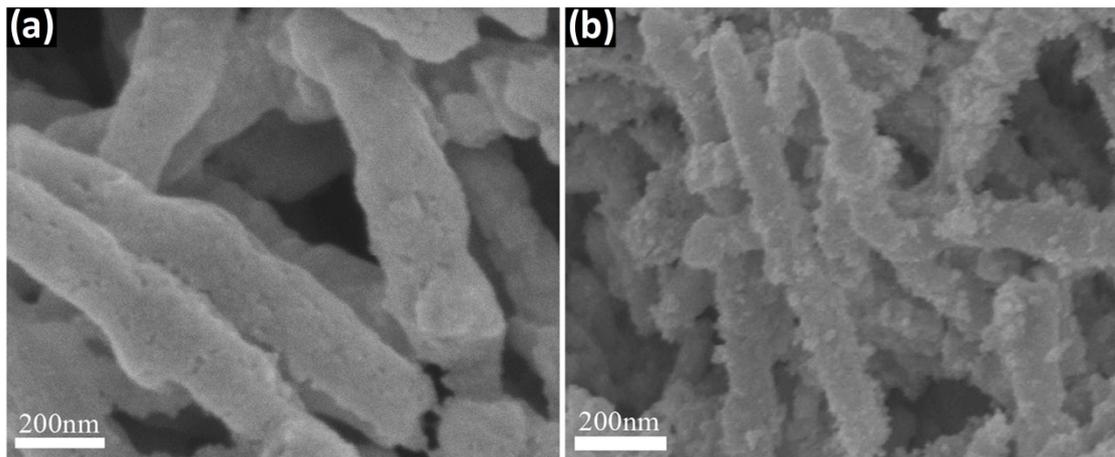


Fig.S2 FESEM images of BaSnO₃ NWs before and after CdS QD-decoration (a) before (b) after.

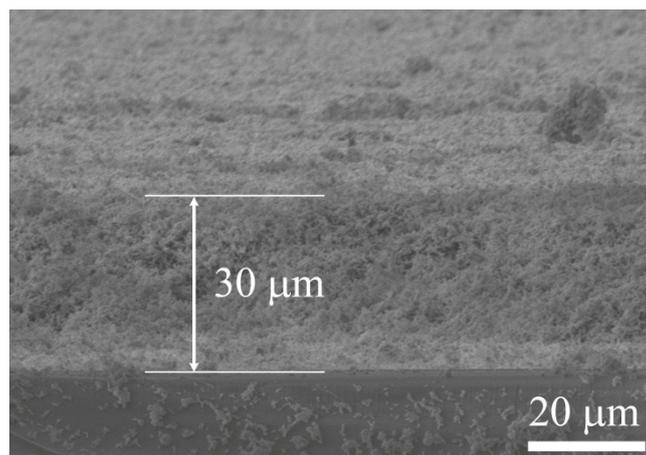


Fig.S3 Cross section image of typical BaSnO₃ NWs-CdS QDs films.

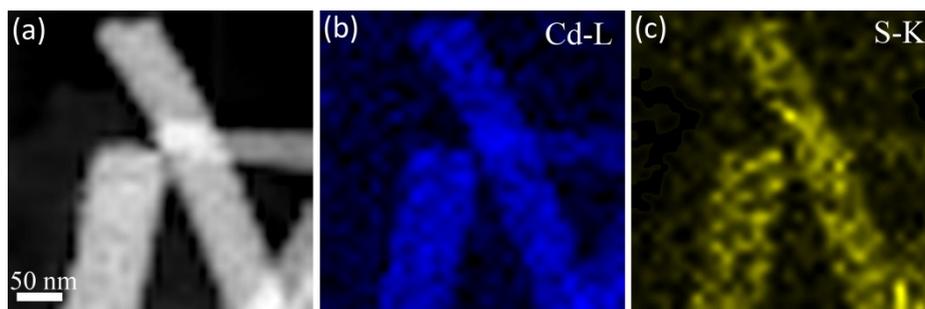


Fig. S4 STEM-EDX element mapping of Cd and S element on the heterostructure.

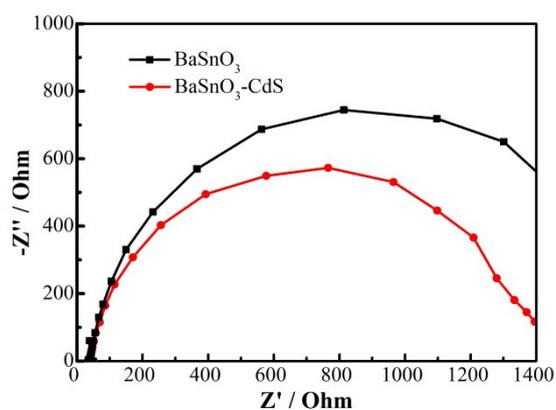


Fig. S5 Nyquist plots of electrochemical impedance spectra of the pristine BaSnO₃ nanowire and BaSnO₃ / CdS heterostructure in 0.25 M Na₂S and 0.35 M Na₂SO₃ aqueous solution.

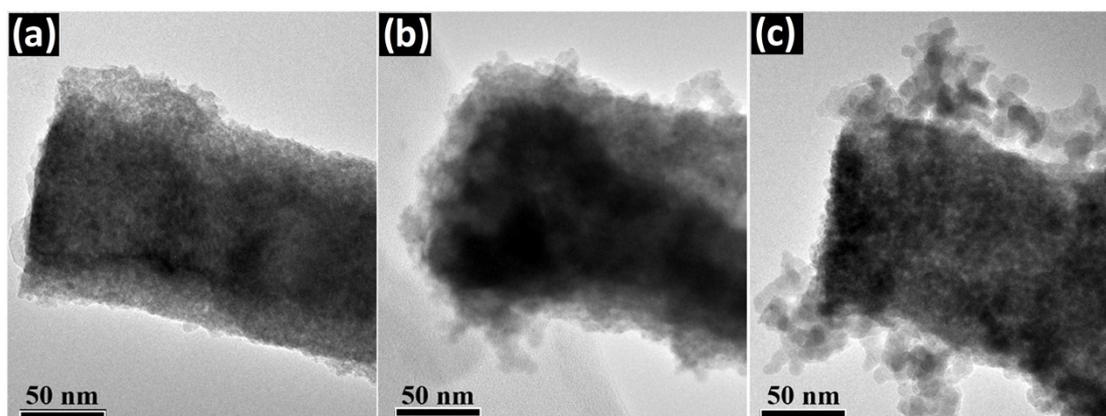


Fig.S6 TEM images of BaSnO₃ NWs-CdS QDs with SILAR cycles of 5 (a), 10 (b) and 15 (c).

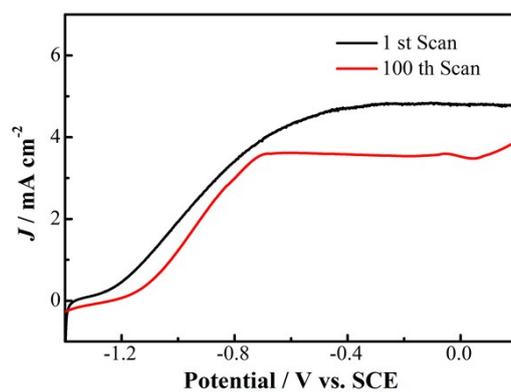


Fig. S7 Stability of PEC performance of CdS decorated BaSnO₃ after 100 scans.

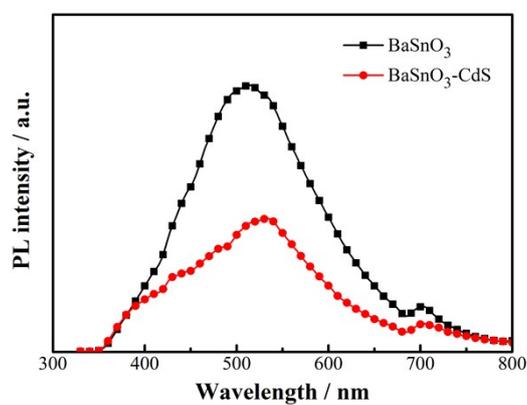


Fig. S8 The photoluminescence spectra of BaSnO₃ NWs and CdS decorated BaSnO₃ NWs.

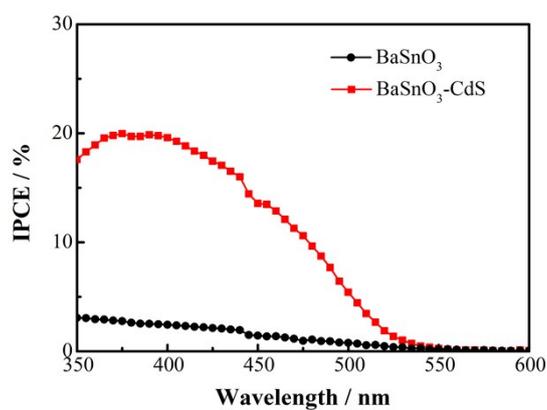


Fig. S9 IPCE spectra of BaSnO₃ nanowire and CdS QDs decorated BaSnO₃ nanowire.

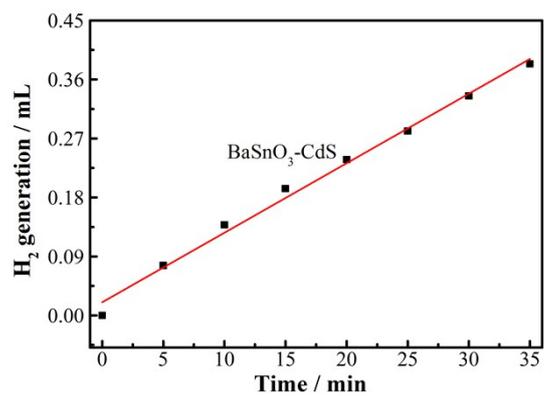


Fig. S10 The rate of hydrogen generation from CdS QDs decorated BaSnO₃ NW photoanode under AM 1.5 illumination.