

# Electrocatalysis

Carbon dioxide electroreduction to C<sub>2</sub> products over copper-cuprous oxide derived from electrosynthesized copper complex

*Nature communication* <https://doi.org/10.1038/s41467-019-11599-7>

**In situ electrosynthesis of the Complex-1 to 5 on Cu substrate.** The structures of the ligands used are shown in Supplementary Scheme 1. The procedures were similar to that used for the electrosynthesis of metal organic frameworks<sup>40,41</sup>. Typically, two Cu foils with dimension of 0.2 mm × 10 mm × 10 mm were used for the working and counter electrode with a gap of 1 cm and the electrochemical experiments could be controlled by a DC mode on a galvanostat/potentiostat (CS310, Wuhan Corrtest Instrument Co., China). The electrolyte consisted of 25 mL of ethanol/water (75:25 vol%) solution, 5–15 mg MTAB (99.9%, supporting electrolyte), and 5 mg Cu-complex-1 (or 15 mg Complex-2, or 10 mg Complex-3, or 5 mg Complex-4, or 15 mg Complex-5, or 15 mg Complex-6). The electro-synthesis was performed by applying a potential difference of 9.0 V between the Cu foil electrodes in 70 °C electrolyte. Cu-Complex was in situ formed at the anode.

Transient and general synthesis of high density and ultrasmall nanoparticles on two-dimensional porous carbon via coordinated carbothermal shock

*Nature communication* <https://doi.org/10.1038/s41467-023-38023-5>

## Electrochemical characterization

The electrochemical performance was tested in a three-electrode setup by a CS3104 electrochemical workstation. The graphite rod, Ag/AgCl electrode with saturated potassium chloride solution, and as-prepared catalysts were used as the counter, reference, and working electrodes, respectively. The electrolyte was 0.1 M and 1 M KOH solution for the ORR and OER tests, respectively.

## Zinc-air battery test

The batteries performances were tested with homemade zinc-air battery using CS3104 electrochemical workstation. The catalyst ink was drop-casted onto carbon paper, then dried at room temperature, the catalyst loading was 1 mg/cm<sup>2</sup>. A Zinc foil was used as an anode. The zinc-air battery was then assembled by filling the electrolyte (6 M KOH and 0.2 M Zn(Ac)<sub>2</sub>) between the anode and the air-cathode. The cycling test was performed at 10 mA/cm<sup>2</sup> over 30 min discharge followed by 30 min charge per cycle, using a LAND battery testing workstation at ambient air condition.

Enriching Reaction Intermediates in Multishell Structured Copper Catalysts for Boosted Propanol Electrosynthesis from Carbon Monoxide

*ACS NANO* <https://doi.org/10.1021/acsnano.3c01516>

**ECOR Measurements.** Electrochemical measurement was conducted using a Corrtest instrument (CS350H). A flow cell electrolyzer was used for electrolytic processes (see Figure S10 for details). The GDE coated with the prepared catalyst was used as the working electrode, while the Hg/HgO electrode and the IrO<sub>2</sub>/GDE were used as reference and counter electrodes, respectively.

Multi-microenvironment synergistically promoting CO<sub>2</sub> electroreduction activity on porous Cu nanosheets

*Applied Catalysis B: Environmental* <https://doi.org/10.1016/j.apcatb.2022.122119>

correction forms are listed in Table S1. The CO<sub>2</sub> flow was controlled at 25 sccm by an ALICAT mass flow controller. The electrolyte was circulated through the electrochemical cell by a peristaltic pump (BQ 80S, Lead Fluid) with a flow rate of 11 mL min<sup>-1</sup>. All the electrolysis measurements were powered by an electrochemical workstation (CS310H, Wuhan Corrtest Instruments Corp., Ltp) at room temperature and pressure. The gaseous products were analyzed by Gas Chromatograph. The liquid product was quantitatively analyzed by <sup>1</sup>H Nuclear Magnetic Resonance Spectroscopy with 500 μL electrolyte mixed with 200 μL D<sub>2</sub>O and 100 μL DMSO with a certain concentration used as an internal standard.

Synergy of yolk-shelled structure and tunable oxygen defect over CdS/ CdCO<sub>3</sub>-CoS<sub>2</sub>: Wide band-gap semiconductors assist in efficient visible-light-driven H<sub>2</sub> production and CO<sub>2</sub> reduction

*Chemical Engineering Journal* <https://doi.org/10.1016/j.cej.2022.140113>

obtained photocatalysts. The photoelectrochemical tests are performed on an electrochemical workstation (CSStudio5, CorrTest, China) utilizing a standard three-electrode system to investigate the electron-hole separation efficiency. EPR spectra of samples are measured on a EPR

Modulating microenvironment of active moiety in Prussian blue analogues via surface coordination to enhance CO<sub>2</sub> photoreduction

*Separation and Purification Technology* <https://doi.org/10.1016/j.seppur.2023.123230>

#### 2.4. Photoelectrochemistry measurement

The photocurrent (i-t), electrochemical impedance spectra (EIS) and Mott-Schottky (MS) curves of the photocatalysts were measured on electrochemical workstation (CorrTest CS350M) with a standard three electrode system (platinum counter electrode, Ag/AgCl reference electrode and working electrode) in 0.5 mol/L Na<sub>2</sub>SO<sub>4</sub> solution. The production process of the working electrode is described in detail in the support information. A 350 W Xe lamp was used as radiation source.

# HER

Nitrogen-Doped Porous Molybdenum Carbide and Phosphide Hybrids on a Carbon Matrix as Highly Effective Electrocatalysts for the Hydrogen Evolution Reaction

*Advanced energy materials* <https://doi.org/10.1002/aenm.201701601>

*Electrochemical Measurements:* The as-prepared electrocatalyst (4 mg) was dispersed in 2 mL of 9:1 v/v water/Nafion by sonication to form a homogeneous ink. Then, suitable well-dispersed catalyst was coated on a glassy carbon electrode with a catalyst loading of  $0.14 \text{ mg cm}^{-2}$ . The catalyst modified GCE was then dried in an ambient environment for measurements. The commercial 20% Pt/C catalyst was also used as reference samples. Unless otherwise indicated, all the electrochemical experiments were conducted on the electrochemical station (CorrTest-CS350) in a three-electrode system in 0.5 M  $\text{H}_2\text{SO}_4$  (or 1 M KOH) at room temperature, samples performed on the GCE (3 mm in diameter) as the working electrode, a saturated calomel electrode (SCE) as the reference electrode and a Pt wire as the counter

Selective Ethylene Glycol Oxidation to Formate on Nickel Selenide with Simultaneous Evolution of Hydrogen

*Advanced Science* <https://doi.org/10.1002/advs.202300841>

*Electrochemical Characterization:* Electrochemical characterization was performed at room temperature on a CorrTest potentiostat. A conventional three-electrode cell was used, containing a Pt wire as a counter electrode (CE), Hg/HgO as a reference electrode (RE), and GC (5 mm diameter) as the working electrode (WE). To prepare the catalytic ink, 5 mg of dried particles and 10 mg of CB were dispersed in a vial containing 1 mL of MilliQ water and 1 mL of ethanol and 100  $\mu\text{L}$  of 10

Self-assembled  $\text{NiMn}_2\text{O}_4$  shell on nanoporous Ni(Mn) core for boosting alkaline hydrogen production

*Applied Surface Science* <https://doi.org/10.1016/j.apsusc.2022.156152>

## 2.3. Electrochemical measurements

HER performances were tested using CS2350H electrochemical workstation in a typical three-electrode cell equipped with Hg/HgO as the reference electrode, a graphite sheet as the counter electrode and dealloyed material as the working electrode. The working electrode was prepared as follows: 4 mg of catalyst powder and 1 mg acetylene black were ultrasonically mixed with 400  $\mu\text{L}$  isopropanol and 100  $\mu\text{L}$  Nafion solution (0.5 wt%) to form a well-dispersed catalyst ink. Then, 10  $\mu\text{L}$  of the catalyst ink was pipetted and uniformly spread on the surface of carefully polished glassy carbon electrode (GCE,  $\Phi = 5 \text{ mm}$ ,  $A = 0.196 \text{ cm}^2$ ). After the ink naturally dried in air, another 5  $\mu\text{L}$  Nafion solution

WS2 moire superlattices derived from mechanical flexibility for hydrogen evolution reaction

*Nature communication* <https://doi.org/10.1038/s41467-021-25381-1>

**Electrochemical measurements.** All the electrochemical experiments were carried out using a conventional three-electrode system on an Electrochemical Workstation (CS310, Wuhan Kesite Instrument Co., Ltd.). All electrochemical performance tests of samples were carried out on CFC (Phychemi (HK) Company Limited-W0S1010). A typical three-electrode configuration was used to investigate all samples' HER performance with an Ag/AgCl electrode and a graphite rod as the reference and counter electrodes, respectively. All the electrochemical measurements were conducted in Ar-bubbled 0.5 M H<sub>2</sub>SO<sub>4</sub> electrolyte at room temperature. All potentials were referenced to the reversible hydrogen electrode (RHE). Before the

## NRR

A Bioinspired Iron-Centered Electrocatalyst for Selective Catalytic Reduction of Nitrate to Ammonia

*ACS Sustainable Chemistry Engineering* <https://doi.org/10.1021/acssuschemeng.2c00389>

**Electrocatalytic Test.** The electrochemical measurements were conducted using a CorrTest CS310 electrochemical workstation in an H-type electrolytic cell separated by a Nafion 117 membrane (DuPont). The Nafion 117 membrane was boiled in 5% H<sub>2</sub>O<sub>2</sub> for 1 h and then washed several times using ultrapure water before tests. Carbon cloth-based FeNPs@MXene, saturated calomel electrode (SCE), and platinum foil were used as the working electrode, reference electrode, and counter electrode, respectively. The size of the working electrode was tailored to 1 × 1 cm<sup>2</sup>. The anode and cathode compartment were filled by 0.5 M Na<sub>2</sub>SO<sub>4</sub> solution (100 mL). KNO<sub>3</sub> solution was injected into the cathode compartment for

## OER

Ex Situ Reconstruction-Shaped Ir/CoO/Perovskite Heterojunction for Boosted Water Oxidation Reaction

*ACS Catalysis* <https://doi.org/10.1021/acscatal.2c05684>

The OER performance tests were carried out in a traditional three-electrode system at room temperature on a Corrtest 2350H electrochemical station in a PTFE bottle. The RDE, a Hg/HgO electrode, and a Pt wire were used as the working electrode, reference electrode, and counter electrode, respectively. The Hg/HgO electrode was calibrated and its potential was converted to the RHE scale, giving their conversion equation in the 1 M KOH electrolyte:  $E_{\text{vs RHE}} = E_{\text{vs Hg/HgO}} + 0.905 \text{ V}$ . All electrochemical tests were conducted in 1 M KOH, which was saturated with O<sub>2</sub> (99.999%) before OER testing. Before the OER measurement, 10 cycles of CV were applied from 1.1 to 1.8 V versus RHE at a scan rate of 100 mV s<sup>-1</sup> to activate the electrocatalysts. A LSV was measured at a scan rate of 10 mV s<sup>-1</sup>. The Tafel curves were measured at a slow scan rate of 1 mV s<sup>-1</sup>. Meanwhile, all potentials in this work were compensated for iR-drop.

The two-electrode system and the chronopotentiometry (CP) method were used to observe stability in the 1 M KOH solution. To prepare the catalyst electrode, we sonicated a catalyst ink of 10 mg of catalyst, 10 mg of acetylene black, 1

High Configuration Entropy Activated Lattice Oxygen for O<sub>2</sub> Formation on Perovskite Electrocatalyst

*Advanced functional materials* <https://doi.org/10.1002/adfm.202112157>

Applying a three-electrode mode with HgO/Hg and carbon rod as reference and counter electrode, respectively, the OER tests were carried out. The catalysts were coated onto the rotating disk electrode (RDE) tip serving as the working electrode. LSV was performed using a Corrtest 2350H electrochemical workstation and a Pine research instrument. The ten-cycle CV scan between 1.1 and 1.8 V versus RHE at a scan speed of 50 mV s<sup>-1</sup> was performed to activate the electrocatalyst. Before each OER measurement, the electrolyte was purged with pure O<sub>2</sub> (99.9%) for at least 30 min. To evaluate the OER activity, the LSV curves were carried at a scan rate of 10 mV s<sup>-1</sup> and a rotating speed of 2500 rpm. The Tafel slope was obtained by applying the LSV scan at the rates of 1 mV s<sup>-1</sup>. The overpotential was iR-corrected using Equation (2):

$$E = E(\text{applied potential versus RHE}) - iR \quad (2)$$

where  $i$  indicates the current, and  $R$  is the ohmic resistance of the electrolyte ( $\approx 5 \Omega$  for 1 M KOH,  $\approx 45 \Omega$  for 0.1 M KOH). The EIS were measured using a Corrtest 2350H electrochemical workstation with a frequency range from 10<sup>6</sup> to 10<sup>-1</sup> Hz. The stability was examined using the chronopotentiometry method and two-electrode mode in 1 M KOH. The catalyst was deposited on Ni foil with a quantity density of 2 mg cm<sup>-2</sup>. The commercial 20 wt% Pt/C was used as the electrode for hydrogen evolution reactions.

Cobalt nanoparticles-encapsulated holey nitrogen-doped carbon nanotubes for stable and efficient oxygen reduction and evolution reactions in rechargeable Zn-air batteries

*Applied Catalysis B: Environmental* <https://doi.org/10.1016/j.apcatb.2023.122386>

### 2.5. Zn-air battery tests

The rechargeable Zn-air battery containing catalysts on the air cathode was prepared as follows. The catalyst paste (3 mL) prepared according to the procedure in Section 2.4 was placed on a carbon paper (HCP030, Alfa Aesar) with a diameter of 1 cm, and then dried at 80 °C for 1 h. The catalyst-loaded carbon paper was examined as the cathode of Zn-air batteries. A polished Zn plate purchased from Alfa Aesar was used as the anode of Zn-air batteries. The electrolyte was prepared by dissolving KOH (6 M) and zinc acetate (0.2 M) in the water. The performance of the Zn-air battery was explored using an electrochemical workstation (CS350, CorrTest, China).

## ORR

Hollow Loofah-Like N, O-Co-Doped Carbon Tube for Electrocatalysis of Oxygen Reduction

*Advanced functional materials* <https://doi.org/10.1002/adfm.201900015>

*Electrochemical Measurements:* Electrochemical measurements were performed on an electrochemical workstation (CS Studio5) with a conventional three-electrode system in 0.1 M KOH solution. Pt wire, saturated calomel electrode (SCE), and a catalyst layer covered glassy carbon electrode (GCE, diameter 5 mm) were used as the counter electrode, reference electrode, and working electrode, respectively. The working electrode was prepared according to the following process. 5 mg of the grinded catalyst powder was dispersed into 1 mL Nafion ethanol solution (0.25 wt%) by sonicating to obtain uniform catalyst ink. 20  $\mu$ L ink was added onto the clean GCE three times to form a smooth carbon film. Before testing, the electrolyte was first purged with high-purity N<sub>2</sub> or O<sub>2</sub> gas for at least 30 min. All CV curves and LSV curves were carried out at a scan rate of 50 and 10 mV s<sup>-1</sup>, respectively.

Synergistic Binary Fe–Co Nanocluster Supported on Defective Tungsten Oxide as Efficient Oxygen Reduction Electrocatalyst in Zinc-Air Battery

*Advanced Science* <https://doi.org/10.1002/advs.202104237>

*Zinc–Air Battery (ZAB) Tests:* The catalyst ink was prepared by dispersing 13.5 mg catalyst into 20 mL isopropanol solution containing 5 wt% nafion and ultrasonicated for 30 min. Then, the catalysts ink was sprayed onto carbon fiber paper and used as cathode. The catalyst loading was 1.0 mg cm<sup>-2</sup>. The Pt/C cathode was prepared in the same method. The loading was 1.0 mg cm<sup>-2</sup>. Polished zinc foil and 6.0 M KOH solution were used as anode and electrolyte, respectively. Polarization curves were tested on a CS2350 station. The discharge curves and the rate performance were

*Flexible Batteries Tests:* The method of preparing catalyst ink is the same as that of zinc–air battery. The carbon cloth (CC) was soaked overnight in catalyst ink and then removed to dry. The flexible battery was assembled by CC loaded with catalyst used as the cathode, zinc foil as the anode and a filter paper impregnated with 6.0 M KOH solution as the separator. The open circuit voltage (OCV) and polarization curves of the battery were tested on a CS2350 station.

## Photoelectrochemical

Modulating microenvironment of active moiety in Prussian blue analogues via surface coordination to enhance CO<sub>2</sub> photoreduction

*Separation and Purification Technology* <https://doi.org/10.1016/j.seppur.2023.123230>

### 2.4. Photoelectrochemistry measurement

The photocurrent (i-t), electrochemical impedance spectra (EIS) and Mott-Schottky (MS) curves of the photocatalysts were measured on electrochemical workstation (CorrTest CS350M) with a standard three electrode system (platinum counter electrode, Ag/AgCl reference electrode and working electrode) in 0.5 mol/L Na<sub>2</sub>SO<sub>4</sub> solution. The production process of the working electrode is described in detail in the support information. A 350 W Xe lamp was used as radiation source.

Accelerated photocatalytic degradation of diclofenac by a novel CQDs/ BiO<sub>2</sub>COOH hybrid material under visible-light irradiation: Dechlorination, detoxicity, and a new superoxide radical model study

*Chemical Engineering Journal* <http://dx.doi.org/10.1016/j.cej.2017.09.118>

scanning electron micrograph (SEM) with a JSM-7001F (Japan) system. The surface elements were measured by using an energy dispersive spectroscopy (EDS, HORIBA EX-250). The morphology of the photocatalyst was elucidated using a transmission electron microscope (TEM, JEOL JEM-2100F). The UV–vis diffuse reflectance spectra (DRS) were obtained with a Shimadzu spectrophotometer (UV-2550). Photocurrent and EIS measurements were conducted using a CS350 electrochemical workstation.

Effect of rutile TiO<sub>2</sub> on the photocatalytic performance of g-C<sub>3</sub>N<sub>4</sub>/brookite-TiO<sub>2</sub>-xNy photocatalyst for NO decomposition

*Applied Surface Science* <http://dx.doi.org/10.1016/j.apsusc.2016.09.075>

of the surface adventitious carbon. The photoluminescence (PL) spectra were obtained on an FLS-920T fluorescence spectrophotometer. The excitation wavelength was 390 nm. Both of the width for excitation and emission slits were 1.5 nm. The specific surface areas were measured out by the BET method (Micromeritics Instrumentns, TriStar  $\alpha$ 3020). Photocurrents were measured using an electrochemical analyzer (CS310 Instruments) in a standard three-electrode system using the prepared samples as the working electrodes with an active area of ca.  $1.0 \times 1.0 \text{ cm}^2$ , a Pt foil and an Ag/AgCl (saturated KCl) electrode were used as the counter electrode and reference electrode, respectively. A 0.1 M  $\text{Na}_2\text{SO}_4$  aqueous solution was used as the electrolyte. A 300 W Xe lamp served a visible light source with  $0.11 \text{ mW/cm}^2$  intensity. Working electrodes were prepared as follows: 15 mg of photocatalyst were ground with 40  $\mu\text{L}$  of Alpha-Terpineol and 20  $\mu\text{L}$  of ethanol to make slurry. The slurry was then coated onto a  $1.0 \times 1.0 \text{ cm}^2$  F-doped  $\text{SnO}_2$ -coated glass (FTO glass) electrode by the doctor blade technique. Next, these electrodes were dried in an oven and calcined at  $350^\circ\text{C}$  for 2 h.

Single metal atom oxide anchored  $\text{Fe}_3\text{O}_4$ -ED-rGO for highly efficient photodecomposition of antibiotic residues under visible light illumination

*Applied Catalysis B: Environmental* <https://doi.org/10.1016/j.apcatb.2021.120740>

monochromator. Then, the XAFS raw data were background-subtracted, normalized and Fourier transformed by the standard procedures with the IFEFFIT package. The oxidation state of elements present in the nanocomposites material was analyzed by X-ray photoelectron spectroscopy (XPS), PHI Quantum 2000. The concentration of organic pollutants was obtained using UV-visible spectrophotometer (UV-1800, Shimadzu). Electron spin resonance (ESR) spectra were obtained using a Bruker model A300 spectrometer with a Philip lamp of 254 nm as light source, and 5,5-dimethyl-1-pyrroline-N-oxide (DMPO) as trapper. The sample is dispersed in purified methanol for the detection of  $\text{O}_2^{\bullet-}$ . The electrochemical impedance spectroscopy (EIS), transient photocurrent response were measured on the electrochemical workstation (Corrtest CS350H). The electrochemical workstation was a standard three-electrode system, in which the catalyst-coated glassy carbon was the working electrode, the carbon rod was the counter electrode and the saturated calomel electrode was the reference electrode. A 500 W Xe arc lamp equipped with a 420 nm cutoff filter was utilized as a light source. EIS spectra was recorded over the frequency range from 0.1 Hz to 100 kHz. The scanning rate of LSV curve is 5 mV/s.

Rational Design of 3D Hierarchical Ternary  $\text{SnO}_2/\text{TiO}_2/\text{BiVO}_4$  Arrays Photoanode toward Efficient Photoelectrochemical Performance

*Advanced science* <https://doi.org/10.1002/advs.201902235>



**PEC Measurements:** The PEC performance of the samples was measured by electrochemical workstation (CS350, CS instrument) with simulated AM1.5G (100 mW cm<sup>-2</sup>) light illumination. The samples, Ag/AgCl (3M KCl), and Pt foil were employed as working electrodes, reference electrode, and counter electrode, respectively. The electrolyte was 0.5 M Na<sub>2</sub>SO<sub>4</sub> mixed solution with 0.1 M Na<sub>2</sub>SO<sub>3</sub> as hole scavenger. The measured potentials was converted from Ag/AgCl to the RHE by the following formula (5)

$$E_{\text{RHE}} = E_{\text{Ag/AgCl}} + 0.059\text{pH} + 0.197 \quad (5)$$

$E_{\text{RHE}}$  is the potential of the RHE,  $E_{\text{Ag/AgCl}}$  is the potential of the reference electrode Ag/AgCl, and pH is the pH value of the electrolyte. Simulated sunlight with 100 mW cm<sup>-2</sup> was offered by a solar simulator (Zolix SS150). EIS spectra were measured in the frequency range of 10<sup>-1</sup> to 10<sup>5</sup> Hz under a 10 mV amplitude. IPCE values were obtained by IPCE system (Zolix Solar cell Scan100) in the wavelength range of 300–550 nm at the bias of 1.23 V versus RHE.

## Water splitting

Efficient decomposition of perfluorooctane sulfonate by electrochemical activation of peroxymonosulfate in aqueous solution: Efficacy, reaction mechanism, active sites, and application potential

*Water Research* <https://doi.org/10.1016/j.watres.2022.118778>

TOC (TOC-L CSH CN200). The released ROSs were measured by an Electron Paramagnetic Response (EPR, Bruker, USA) spectrum with the DMPO or TEMP as spin-trapping reagents. The concentration of the PMS was detected by an ABTS colorimetric method (Liang et al., 2008). **Linear sweep voltammetry (LSV) was carried out in an electrochemical workstation (CS310, CorrTest) with a three-electrode system where Ag/AgCl electrode, Pt wire electrode, and catalysts electrode were used as reference electrode, counter electrode, and working electrode, respectively. In addition, the scanning range was 0~1.5 V at the scanning rate of 5 mV s<sup>-1</sup> during LSV measurements.**

Direct Synthesis of Stable 1T-MoS<sub>2</sub> Doped with Ni Single Atoms for Water Splitting in Alkaline Media

*Small* <https://doi.org/10.1002/sml.202107238>

**Electrochemical Measurements:** A three-electrode system controlled by electrochemical analyzer (CS235OH, Corrtest Instruments Corp., Ltd., China) was applied to carry out all electrochemical measurements. Glassware was used for electrochemical measurements in alkaline electrolyte, that is, in 1 M KOH. A carbon rod counter electrode, and mercury oxide electrode were used in this study. To prepare the working electrode, 5 mg of as-synthesized MoS<sub>2</sub> powder and 50 μL of 5 wt% Nafion solution were dispersed in 1 mL of 1:1 (v/v) water/ethanol, followed by 30 min sonication to create a homogeneous ink. 50 μL

Multi-configuration structure based on catalysis electrodes and composite membrane for efficient alkaline water splitting

*Chemical Engineering Journal* <https://doi.org/10.1016/j.cej.2022.140373>

### 2.5. Electrochemical measurements

The electrochemical measurements were conducted using the CorrTest CS350 electrochemical working station in a standard three-electrode system. A graphite rod and Hg/HgO electrode were used as the counter and reference electrode, respectively. The as-prepared Co: NiFe-LDH/NF and NiFe-Alloy/NF were directly used as working electrodes. Linear sweep voltammetry (LSV) for both HER and OER was conducted at a scan rate of  $10 \text{ mV s}^{-1}$  and without iR-corrected. The Tafel slope can be calculated using the Tafel equation of  $\eta = b \log(j/j_0)$ , where  $\eta$ ,  $b$ ,  $j$ , and  $j_0$  represent the overpotential, Tafel slope, the measured current density, and exchange current density, respectively. Cyclic voltammetry (CV) mode with various scan rates from 10 to  $100 \text{ mV s}^{-1}$  was conducted in the non-Faradaic region to evaluate the electrochemical double-layered capacitance ( $C_{dl}$ ). The electrochemical

Rational Design of 3D Hierarchical Ternary SnO<sub>2</sub>/TiO<sub>2</sub>/BiVO<sub>4</sub> Arrays Photoanode toward Efficient Photoelectrochemical Performance

*Advanced science* <https://doi.org/10.1002/advs.201902235>

**PEC Measurements:** The PEC performance of the samples was measured by electrochemical workstation (CS350, CS instrument) with simulated AM1.5G ( $100 \text{ mW cm}^{-2}$ ) light illumination. The samples, Ag/AgCl (3M KCl), and Pt foil were employed as working electrodes, reference electrode, and counter electrode, respectively. The electrolyte was 0.5 M Na<sub>2</sub>SO<sub>4</sub> mixed solution with 0.1 M Na<sub>2</sub>SO<sub>3</sub> as hole scavenger. The measured potentials was converted from Ag/AgCl to the RHE by the following formula (5)

Ultrathin Lutetium Oxide Film as an Epitaxial Hole-Blocking Layer for Crystalline Bismuth Vanadate Water Splitting Photoanodes

*Advanced functional materials* <https://doi.org/10.1002/adfm.201705512>

Ag|AgCl|3 M KCl electrode as the reference electrode. Phosphate buffer (pH = 7.0) was used as the electrolyte. The PEC cells provided an active illumination area of  $0.18 \text{ cm}^2$  and integrated front/back illumination from a 150 W solar simulator with an AM 1.5G filter ( $100 \text{ mW cm}^{-2}$ ) calibrated by a thermopile optical detector. IPCE measurements were performed with a 300 W xenon arc lamp and a grating monochromator (Newport CS310) equipped with band pass filters to remove high-order diffractions. Each wavelength light power was measured and recorded by an optical power meter (Newport 1918-C) equipped with a UV-enhanced Si photodiode sensor.

Contact us:

Wuhan Corrttest Instruments Corp., Ltd.

Add.: Jinfeng bld. A, Intl. Enterprise Center, Optics valley Ave., East lake High-tech. Dev. Zone, Wuhan city, 430074, China

Email: [sales2@corrtest.com.cn](mailto:sales2@corrtest.com.cn)

Mobile/Wechat/WhatsApp: +86 13469965984

**Website:** <https://www.corrtestinstruments.com/en>

<https://www.corrtest.com.cn/en>

YouTube: [https://www.youtube.com/channel/UCbFRqmde\\_iRXkWG6w9kJRhA](https://www.youtube.com/channel/UCbFRqmde_iRXkWG6w9kJRhA)