Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information for Modified Photoanode by In Situ Growth of Covalent Organic Frameworks on $BiVO_4$ for Oxygen Evolution Reaction

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Table of Contents

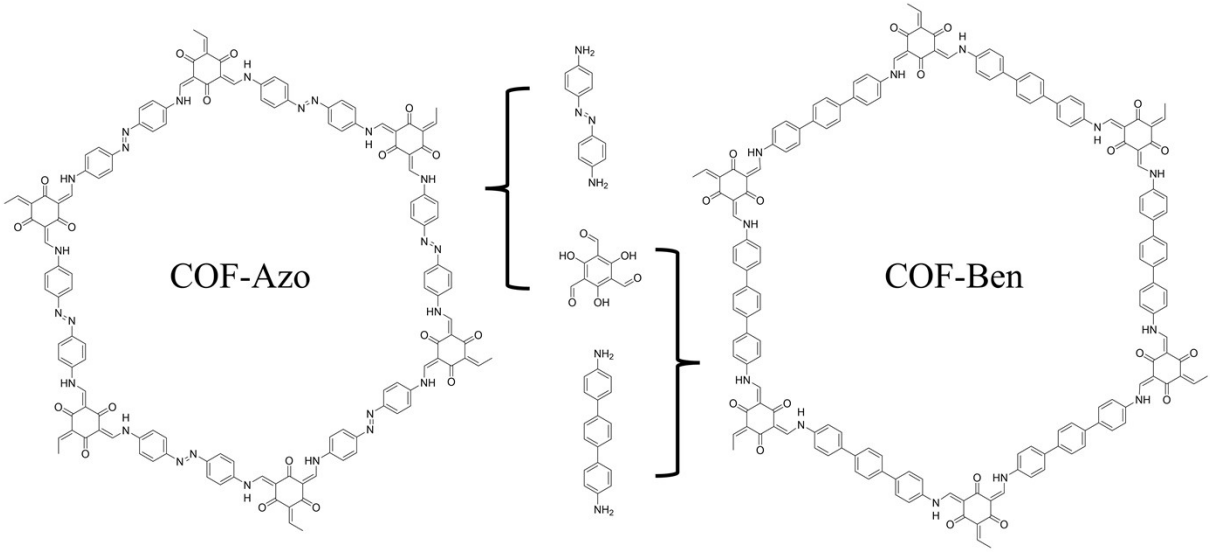
Characterization

The FT-IR spectra were obtained on a Nicolet 22 AVATAR 370 FT-IR spectrometer as a KBr pellet. X-ray powder diffraction analysis was performed on a Rigaku D/max 2500 X-ray diffractometer with Cu Kα radiation. Scanning electron microscopy (SEM) images were collected on a Hitachi Co. S4800 field emission scanning electron microscope. A field emission transmission electron microscope (JEM-2100F) was used to collect high-resolution transmission electron microscopy (HRTEM) images and energy-dispersive X-ray spectroscopy (EDS) was carried out in STEM mode. Diffuse reflectance ultraviolet-visible (DR UV-vis) spectra were recorded on a Shimadzu UV-3600 spectrophotometer. X-ray photoelectron spectroscopy (XPS) was performed on an X-ray ESCALAB 250Xi spectrometer.

Electrochemical and photoelectrochemical measurements

Electrochemical and photoelectrochemical tests were conducted with a typical three-electrode system, in which a platinum plate electrode and a saturated calomel electrode were used as the counter electrode and reference electrode, respectively. Phosphate buffer (0.2 M, pH=7) was used as the electrolyte. A 300 W Xe lamp with an AM 1.5 G filter (Perfect, PLS-SXE300C, China) was the light source and the light intensity reaching the reactor was 100 mW/cm^2. Electrochemical and photoelectrochemical performance was tested by a Zahner IM6 electrochemical workstation. Electrochemical impedance spectra were recorded at 1.23 V vs. RHE with an amplitude of 10 mV from 0.01 Hz to 100 000 Hz. I–t curves were obtained at 1.23 V vs. RHE.

Figures



Scheme. S1 Monomers and structures diagram of COF-Azo and COF-Ben

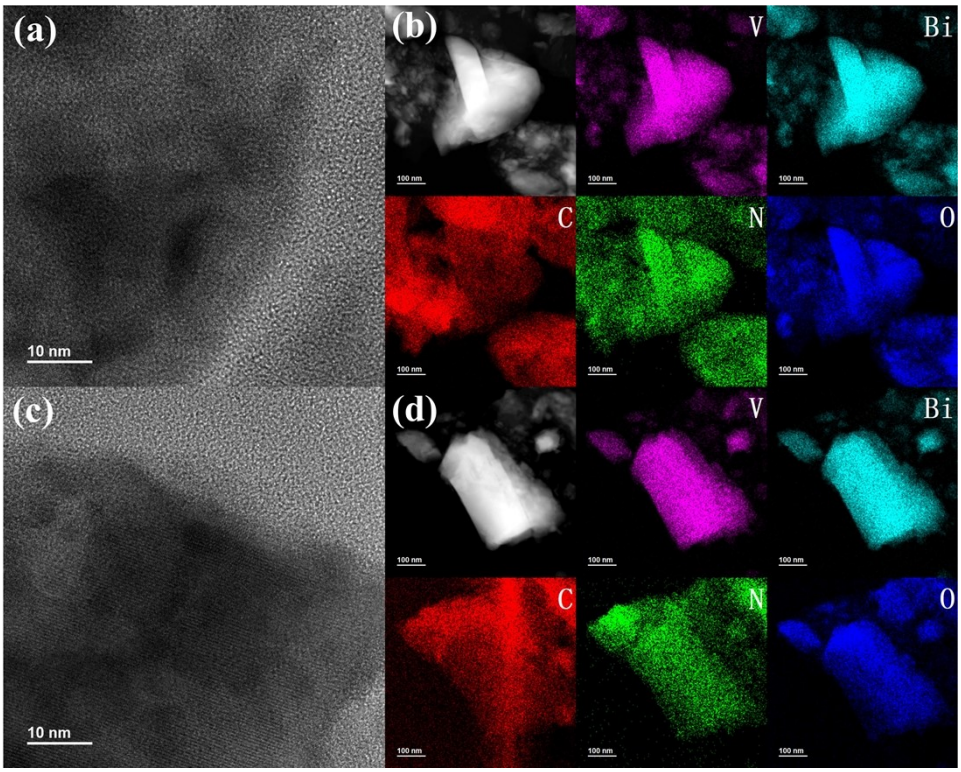


Fig. S1 (a) HRTEM image and (b) element mapping of $BiVO_4$/COF-Azo; (c) HRTEM image and (d) element mapping of $BiVO_4$/COF-Ben

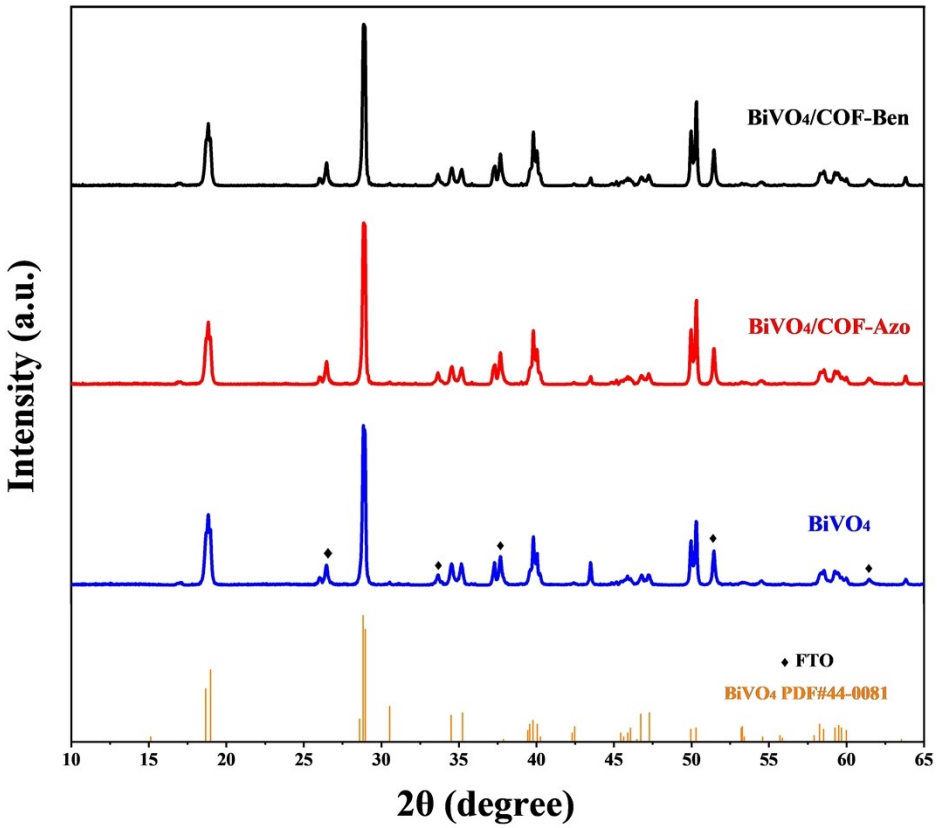


Fig. S2 XRD patterns of $BiVO_4$, $BiVO_4$/COF-Azo and $BiVO_4$/COF-Ben

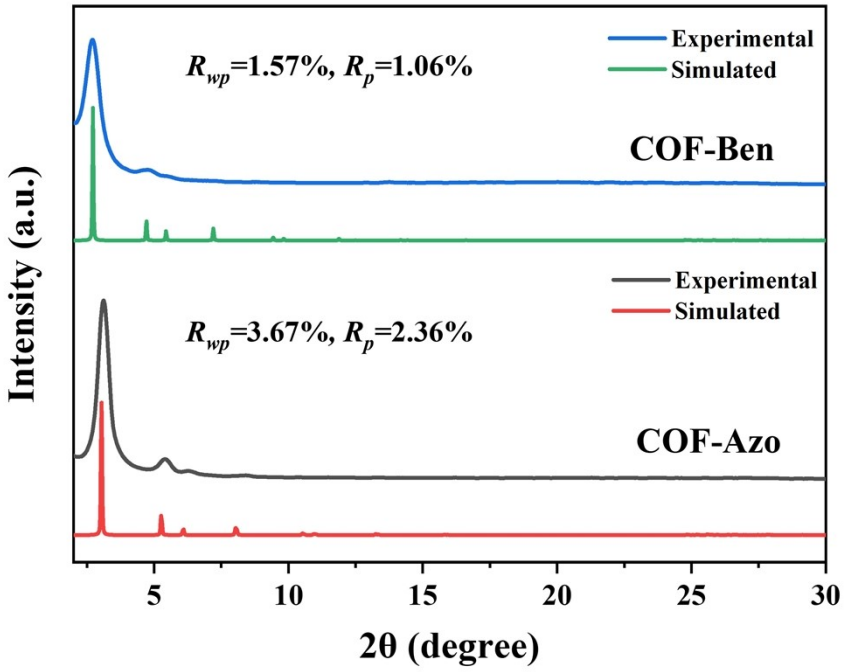


Fig. S3 XRD patterns with experimental and simulated results of COF-Azo and COF-Ben

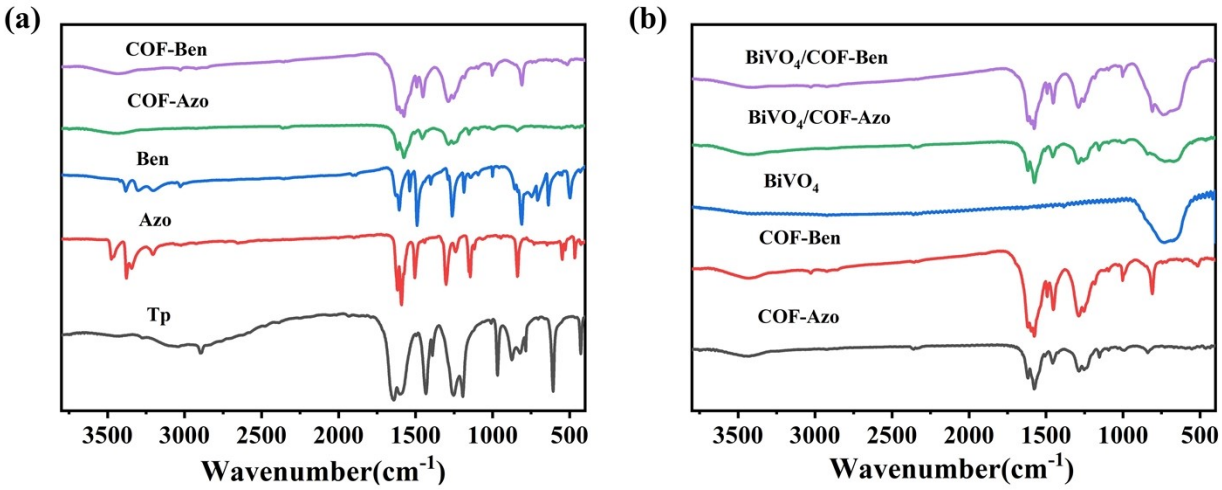


Fig. S4 (a) FT-IR spectra of Tp, Azo, Ben, COF-Azo and COF-Ben; (b) FT-IR spectra of COF-Azo, COF-Ben, $BiVO_4$, $BiVO_4$/COF-Azo and $BiVO_4$/COF-Ben

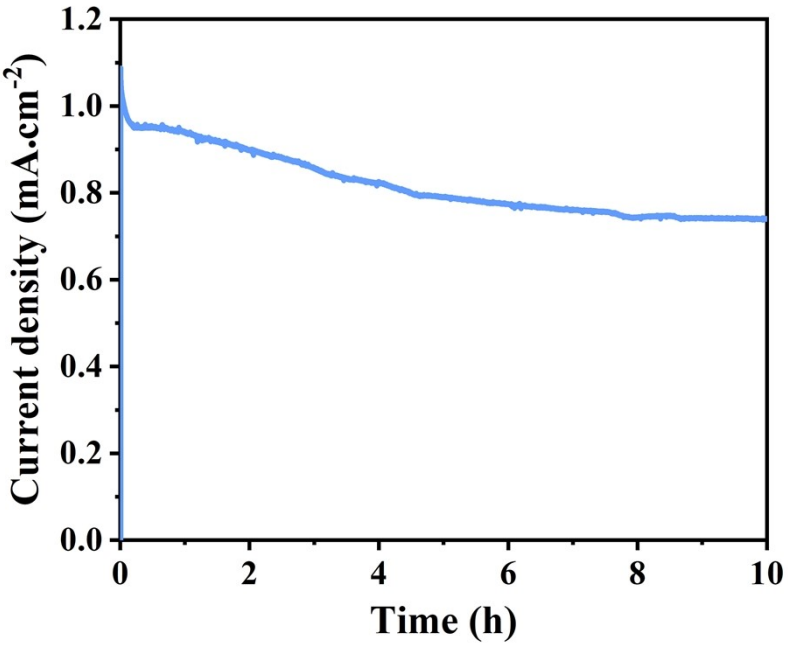


Fig. S5 Stability test curve of $BiVO_4$/COF-Azo photoanode

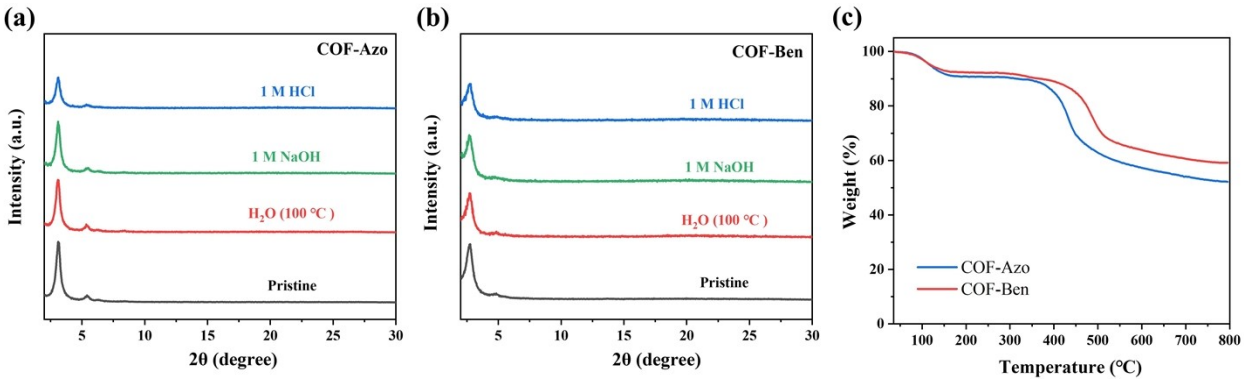


Fig. S6 PXRD patterns for (a) COF-Azo and (b) COF-Ben before and after treatment with water (100 ℃), HCl (1 M), and NaOH (1 M), respectively. (c) TGA curves of COF-Azo and COF-Ben, respectively.