Electronic Supplementary Information

UiO-67 metal-organic gel material deposited on photonic crystal matrix for photoelectrocatalytic hydrogen production

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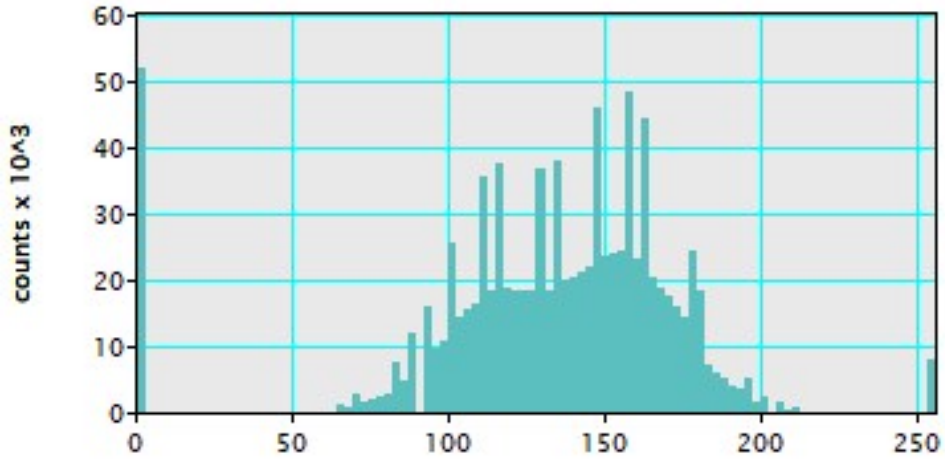

Fig. S1 Statistical particle size distribution of UiO-67/B.

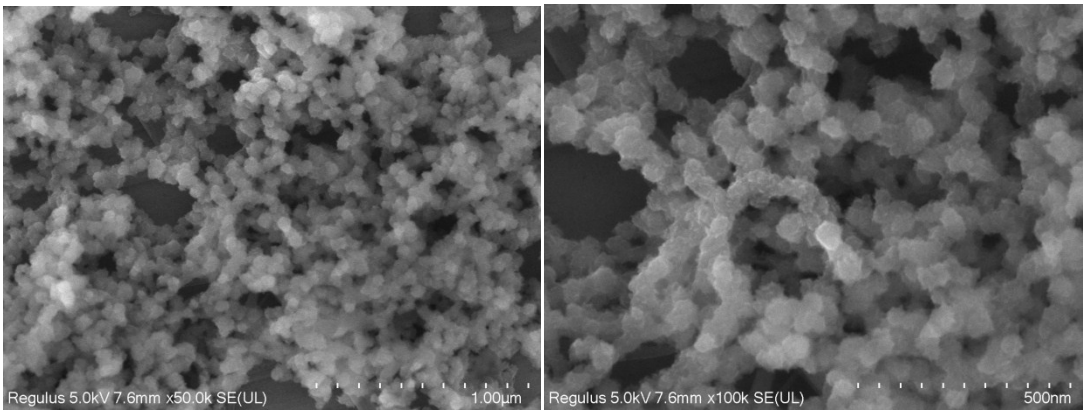

Fig. S2 SEM images of UiO-67 gel (performed using an ultra-high resolution Zeiss Gemini SEM 500 Field-Emission-SEM. Wet UiO-67 gelwas dispersed into ethanol by ultrasound. Samples were treated via Au sputtering before observation.)

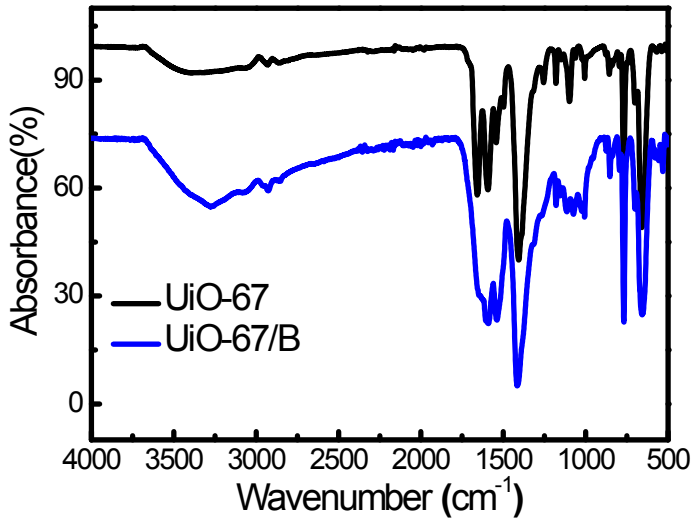

Fig. S3 FT-IR spectra of UiO-67/B and UiO-67.

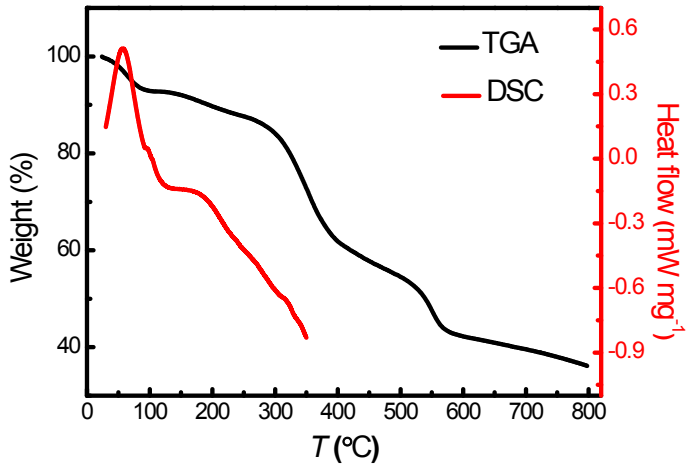

Fig. S4 TG-DSC curves of UiO-67/B recorded under nitrogen atmosphere.

Thermogravimetric analysis (TGA) was performed using a TG 209 F3 Tarsus instrument at heating rate of 10 ^{o}C min^{-1} from 35 to 800 °C under nitrogen atmosphere. Differential scanning calorimetry (DSC) was carried out using Netzsch DSC-204 in the range of 35 - 350 °C under nitrogen stream at heating rate of 10 °C min^{-1}.

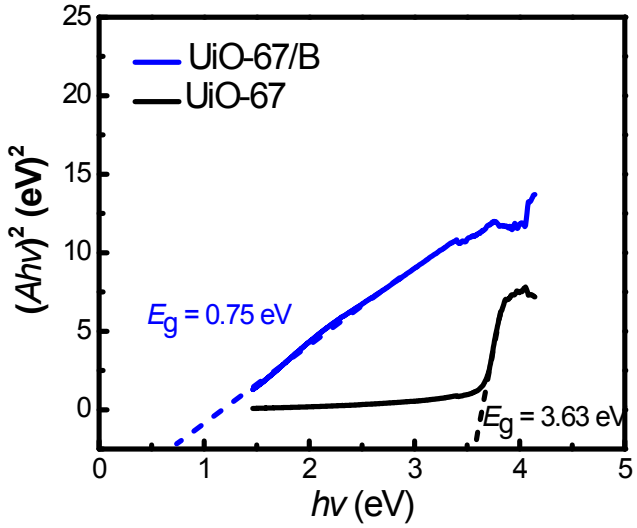

Fig. S5 Band gap calculation of UiO-67 and UiO-67.

The positive slope indicates that UiO-67/B are n-type semiconductors with electron conduction which are trapped from the potonic crystal. In addition, the slopes determined from the analysis of Mott-Schottky plot were used to estimate the carrier density using the equation

$$\frac{1}{C^2} = \frac{2}{e\varepsilon_0\varepsilon N_A}(V - V_{FB})$$

(L. Yu, G. Li, X. Zhang, X. Ba, G. Shi, Y. Li, P. K. Wong, J. C. Yu and Y. Yu, *ACS Catal.*, 2016, **6**, 6444-6454.)

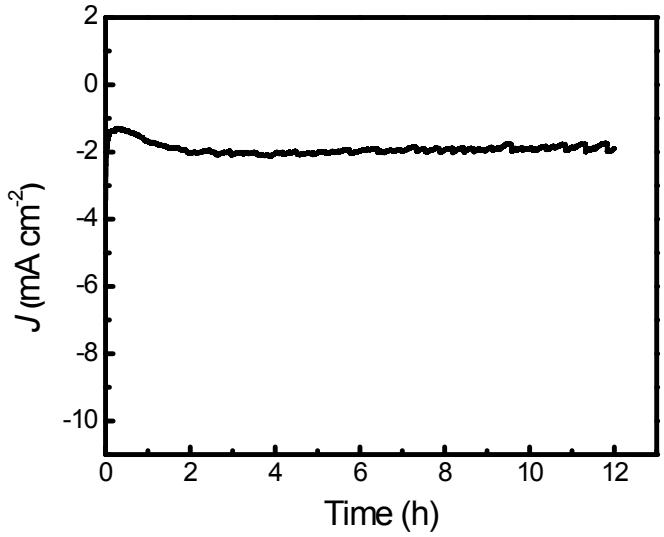

Fig. S6 HER stability test for UiO-67/B at -0.7 V vs RHE using GCE as working electrode.

The stability test was performed on a three-electrode system (CHI660E), which included an Ag/AgCl reference electrode, a carbon rod counter electrode, and glassy carbon electrode as a working electrode. The working electrode was prepared as follows: UiO-67/B (0.2 cm × 0.2 cm) was clipped and attached to the surface of GCE with 0.5 wt% Nafion and dried in air. The stability test was conducted in 0.5 mol L^{-1} H_2SO_4. The results were calibrated with respect to RHE by E(RHE) = E(Ag/AgCl) + 0.197 V.

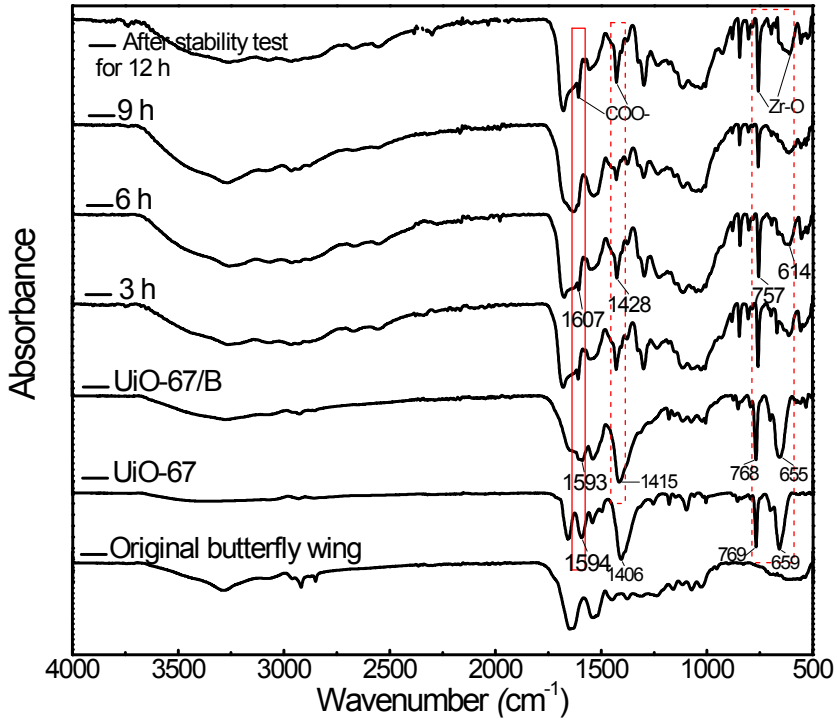

Fig. S7 FT-IR spectra of UiO-67/B over time during the HER stability test.

Table S1 Electrocatalytic performance of UiO-67/B and UiO-67.

Catalyst	Oneset potential (mV vs. RHE)[a]	Tafel slope (mV dec^{-1})
UiO-67/B	449	220
UiO-67	586	228

[a] Potential at which current density exceeded 1 mA cm^{-2}.