Supplementary Information

for

Confining lead-free perovskite quantum dots in metal-organic frameworks for visible light-driven proton reduction

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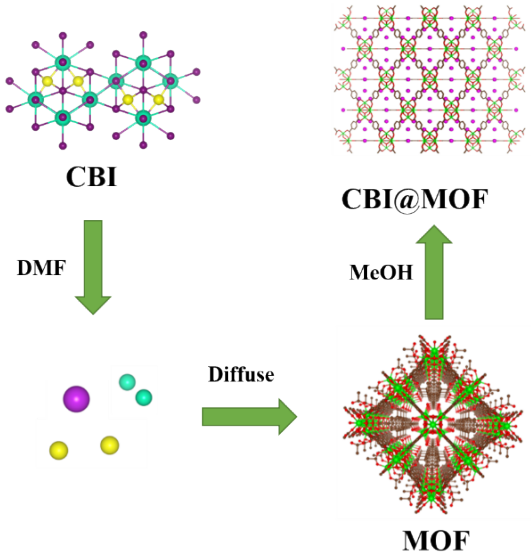
Table S1. ICP-MS analyses of catalysts

Sample	Pt wt%	H_2 evolution rate (μmol g^{-1} h^{-1})
U6N	0	0
Pt@U6N	0.98	87.24
CP@U6N	0.78	141.87

Table S2. Summary of some MOF-based photocatalysts

Sample	Co-catalyst	Light source	Sacrificial reagent	Photosensitizer	H_2 evolution rate (μmol g^{-1} h^{-1})	TON	Reference
CP@U6N	Pt	Visible	HPO_2	None	141.87	17.74	This paper
Zr-MOF	Pt	Visible	TEOA	None	257.38	8.75	1
Zr-MOF	Pt	Visible	TEOA	None	151.48	8.69	2
Zr-MOF	Pt	Visible	TEOA	Rh B	116.1	10.6	3
Zr-MOF	Pt	Visible	benzylamine	None	73.9	3.13	4
Zr-MOF	Pt	Visible	TEOA	None	332	14.08	4
Cr-MOF	Pt	Visible	TEOA	Rh B	580	7.5	5
Zr-MOF	Pd	Visible	TEOA	None	154.2	12.29	6
In-MOF	Pt	Visible	TEOA	None	341	4.5	7

The turnover number was calculated by the equation of TON = $n(H_2)/n(Pt)$ based on the content of Pt.



Scheme S1. Illustration of the synthetic processes of CBI@MOFs.

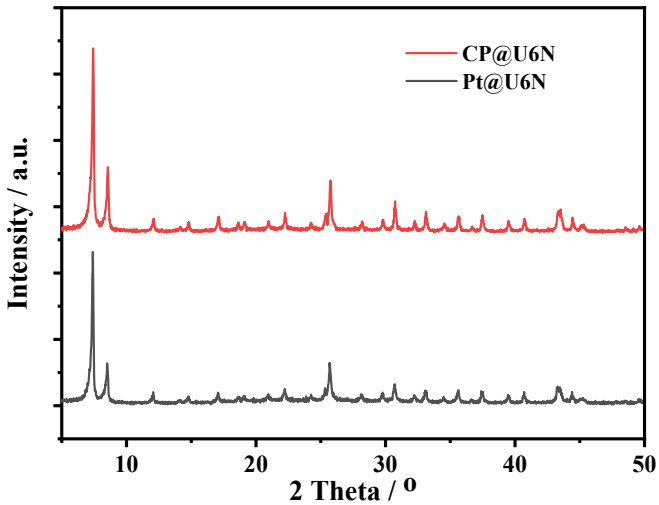


Figure S1. The PXRD pattern of CP@U6N and Pt@U6N.

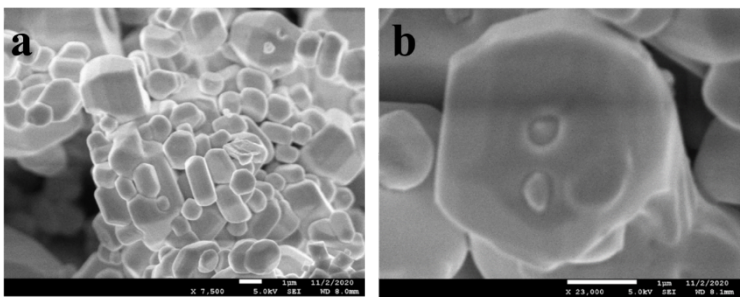


Figure S2. The SEM images of CBI in low resolution (a) and high resolution (b).

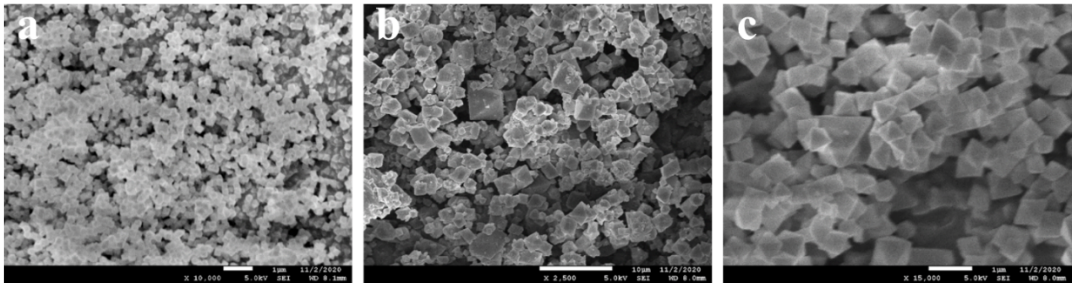


Figure S3. SEM images of U6N (a), UiO-66 (b) and UiO-67 (c).

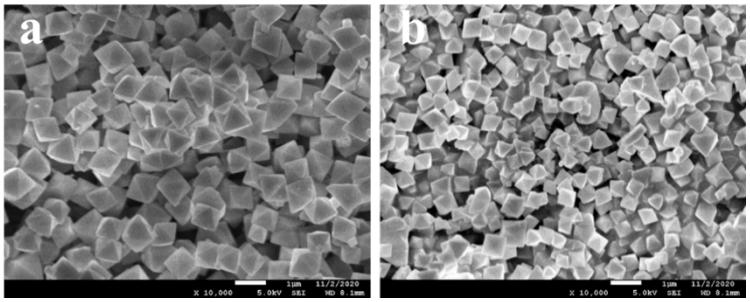


Figure S4. SEM images of CBI@UiO-66 (a) and CBI@UiO-67 (b).

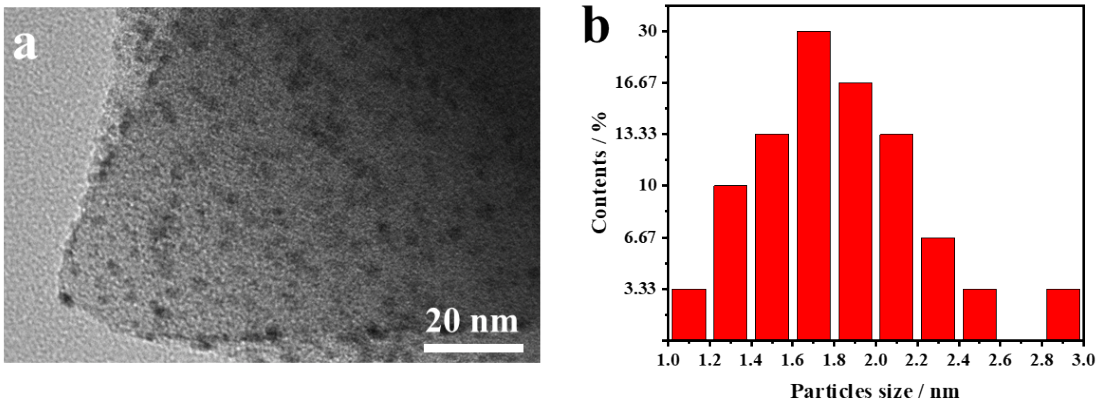


Figure S5. HRTEM image of CP@U6N (a) and Pt particle size distribution of CP@U6N (b).

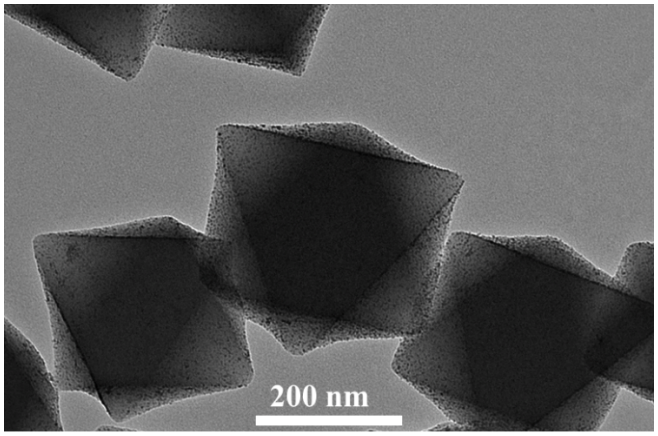


Figure S6. TEM image of Pt@U6N.

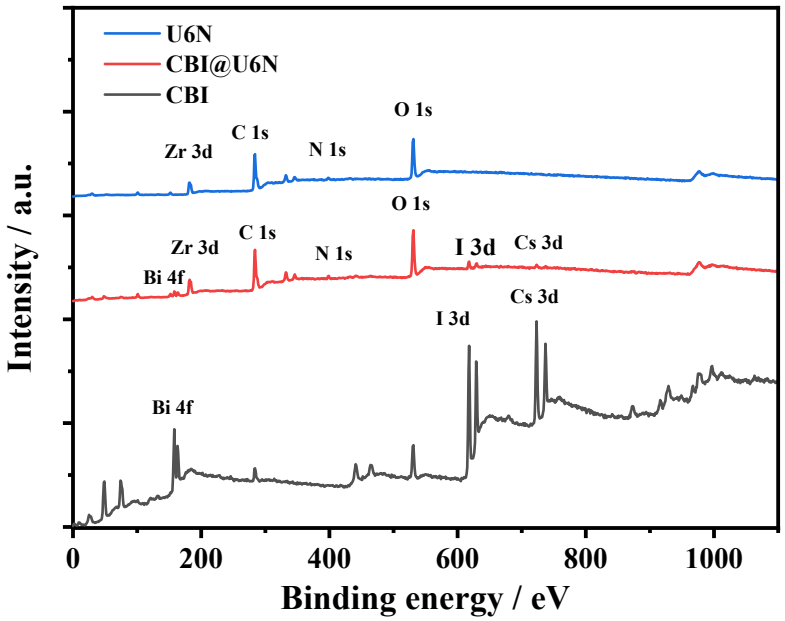


Figure S7. XPS survey spectra of U6N, CBI and CBI@U6N.

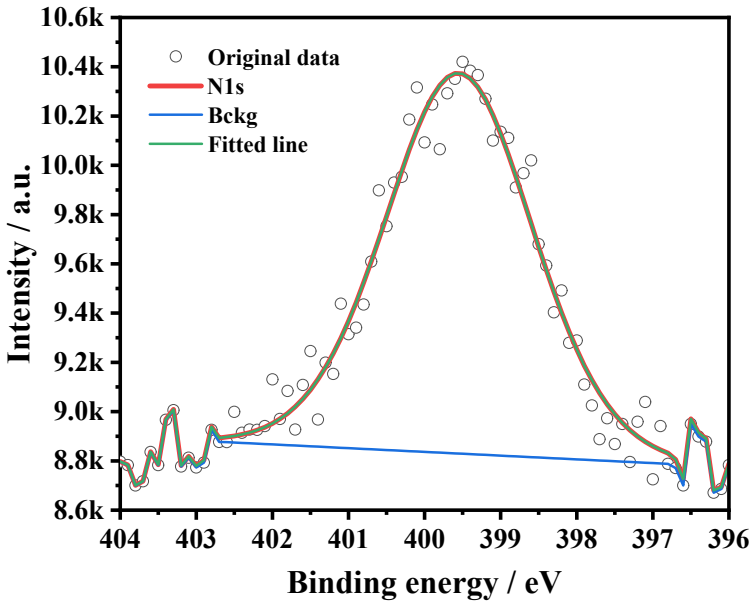


Figure S8. High-resolution N1s XPS spectra of CBI@U6N.

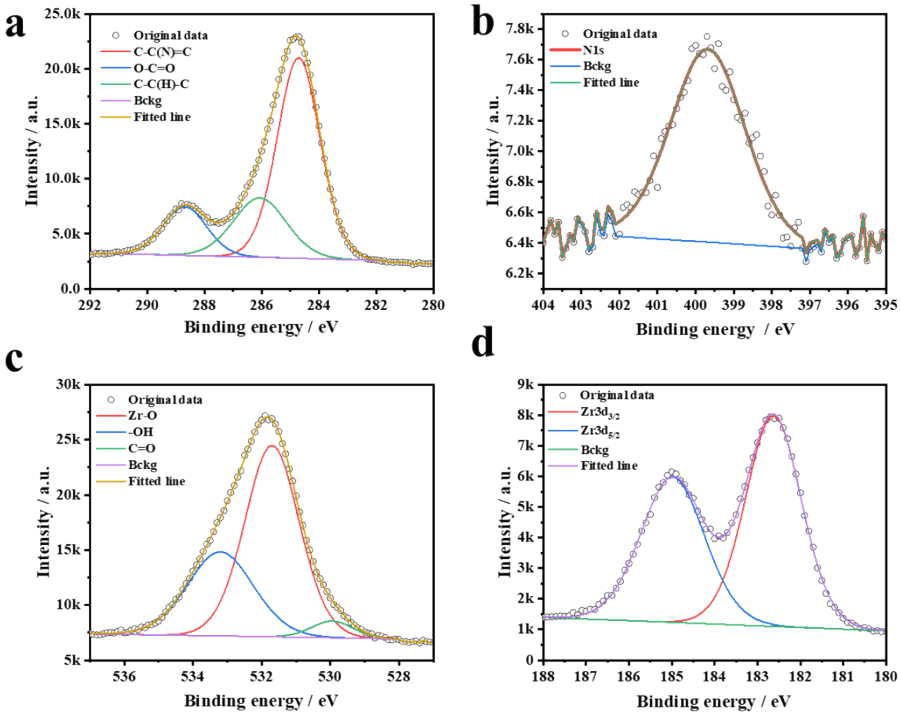


Figure S9. High-resolution C1s (a), N1s (b), O1s (c), and Zr3d (d) of U6N.

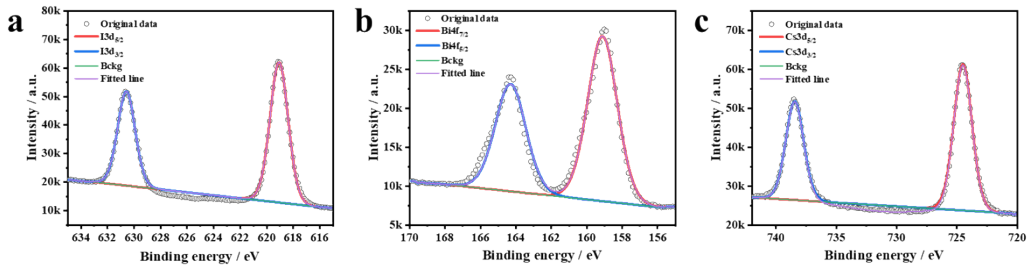


Figure S10. High-resolution Cs3d (a), I3d (b) and Bi4f (c) XPS spectra of CBI.

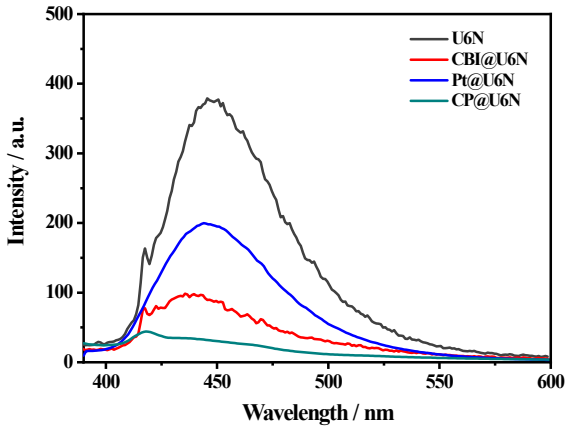


Figure S11. Photoluminescent emission spectra of U6N, CBI@U6N, Pt@U6N and CP@U6N.

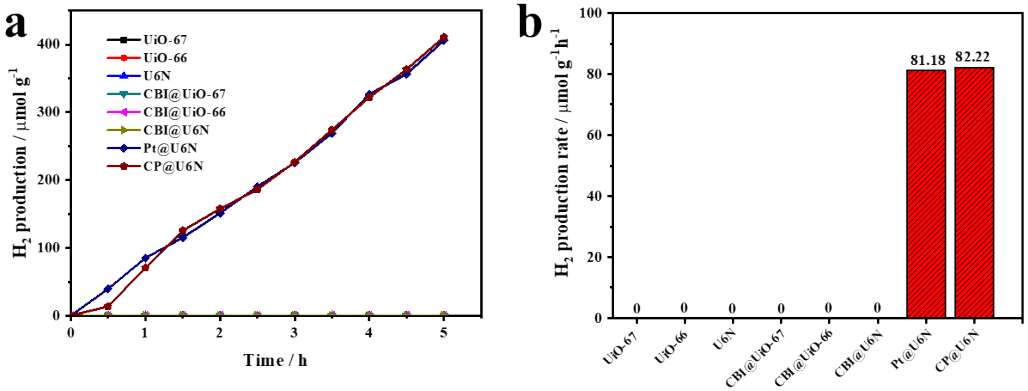


Figure S12. The hydrogen evolution curves (a) and rates (b) of pure MOFs, CBI and CBI@MOFs under visible light. Reaction conditions: 4 mL TEOA, 20 mg of catalyst, 36 mL acetonitrile and 1 mL H_2O, 300W Xe lamp without filter.

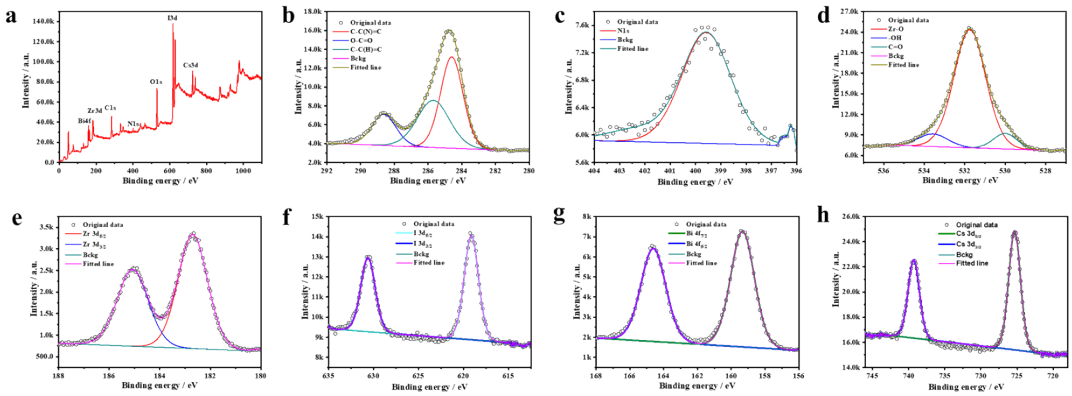


Figure S13. XPS survey spectra (a) and high-resolution C1s (b), N1s (c), O1s (d), and Zr3d (e), I3d (f) and Bi4f (g Cs3d (h) spectra of CBI@U6N after 5h reaction.

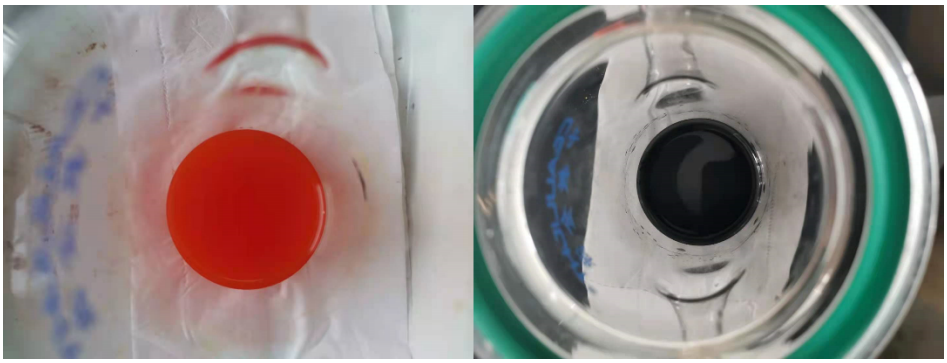


Figure S14. Optical photograph of the reaction solution of CBI@U6N (left) and photocatalytic reaction after 5h without any H_3PO_2 (right).

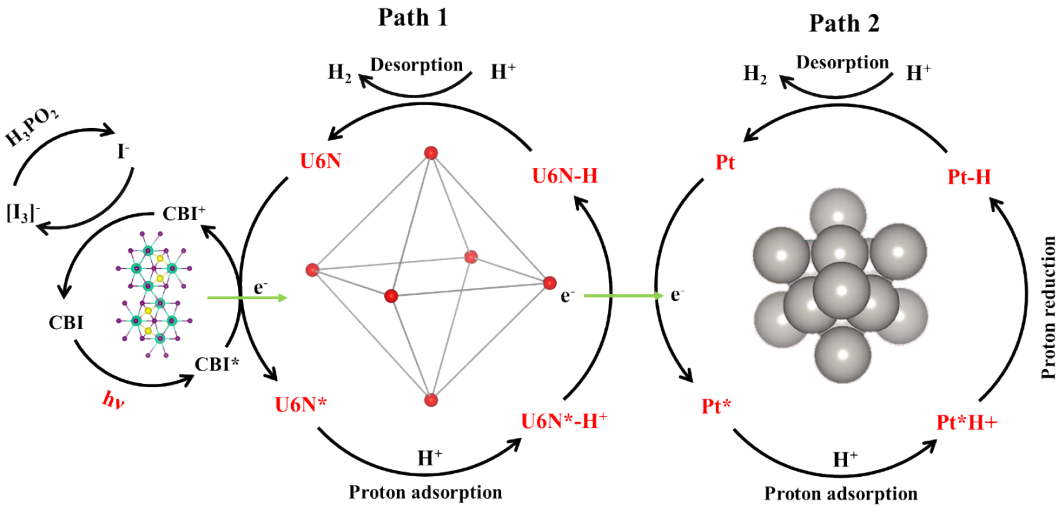


Figure S15. The proposed electron transfer and proton reduction mechanism in CBI@U6N and CP@U6N.

References

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