Electronic Supplementary Information (ESI)

Metal oxide hollow heterojunctions derived from bimetal-organic frameworks for efficient urea photosynthesis

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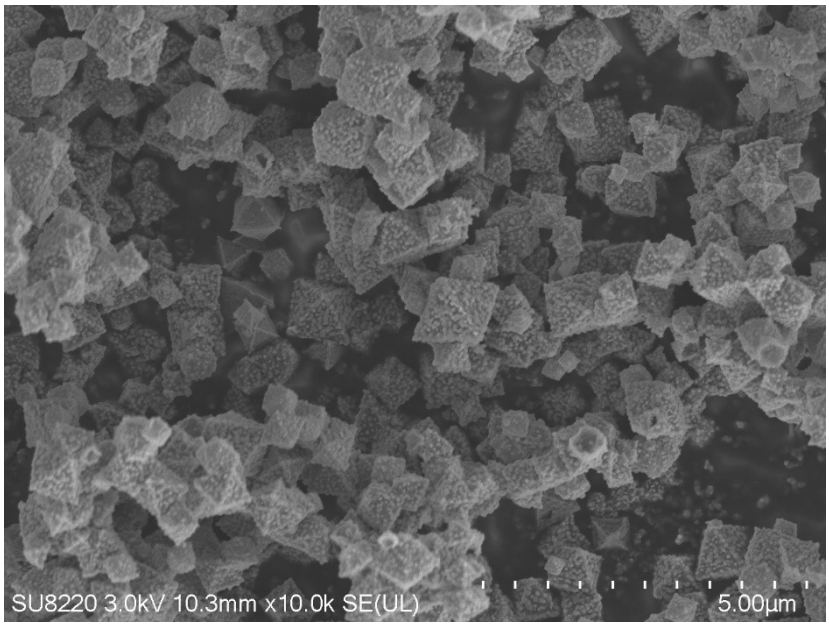
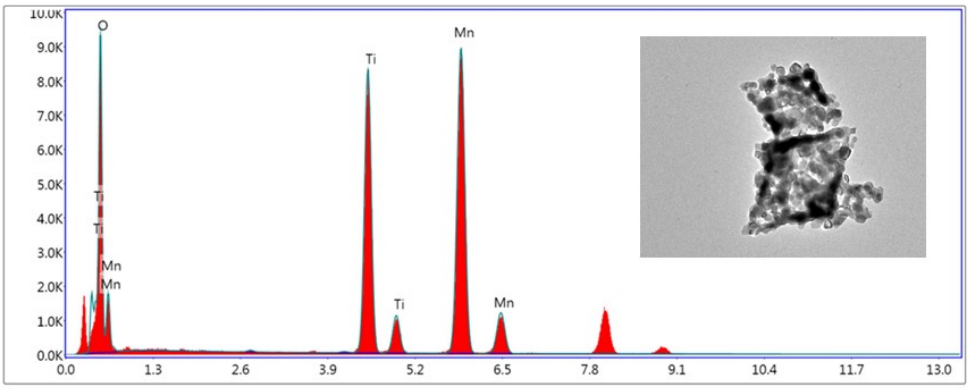


Fig. S1. SEM of TMO-7

eZAF Smart Quant Results

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
OK	89.28	96.39	769.5	5.09	0.50	1.01	0.98	0.55	1.00
TiK	5.23	1.89	1510.2	3.80	0.06	0.90	1.10	1.33	1.02
MnK	5.49	1.73	1845	2.53	0.06	0.90	1.12	1.21	1.00



Lsec: 66.0 0 Cnts 0.000 keV Det: Apollo XLT2 SUTW Det

Fig. S2. TEM and EDX of TMO-8

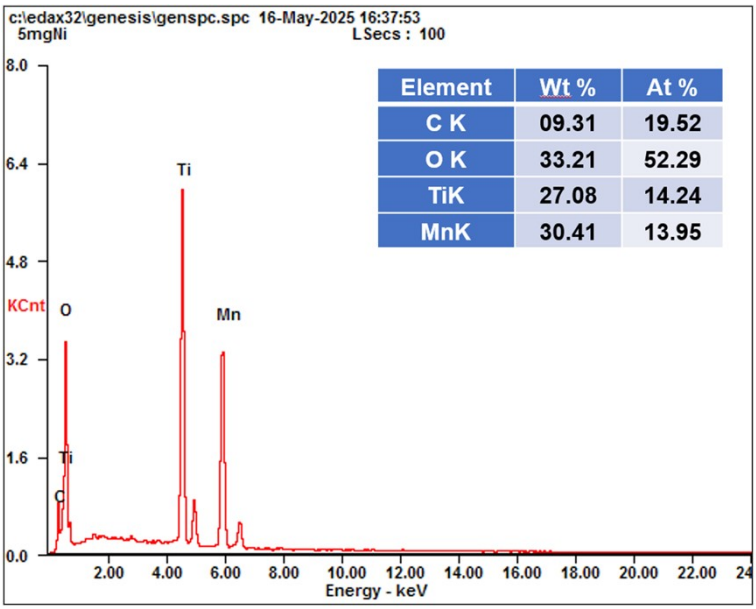


Fig. S3. EDX of TMO-7

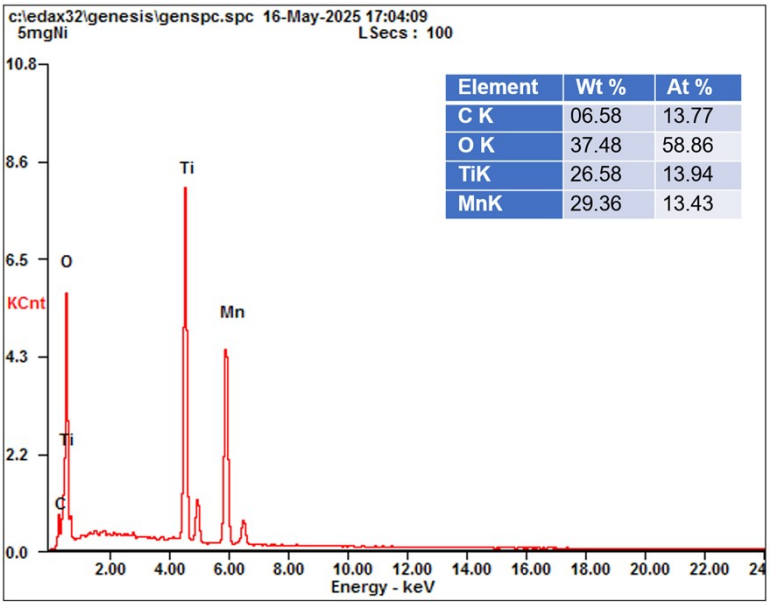


Fig. S4 EDX of TMO-8

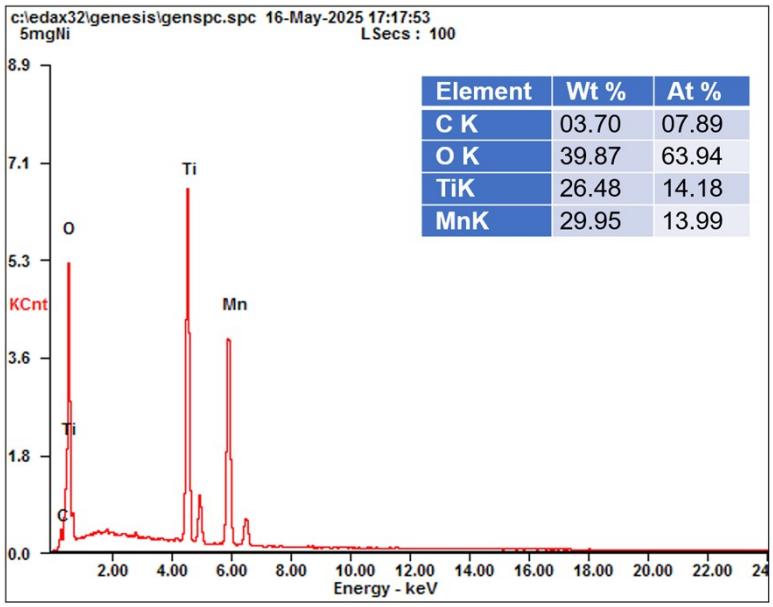


Fig. S5. EDX of TMO-9

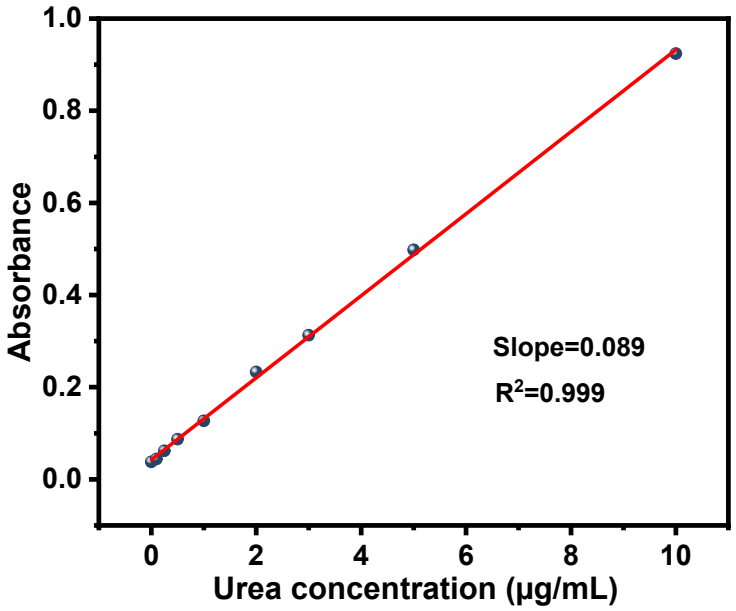


Fig.S6. standard curve for urea quantitative analysis.

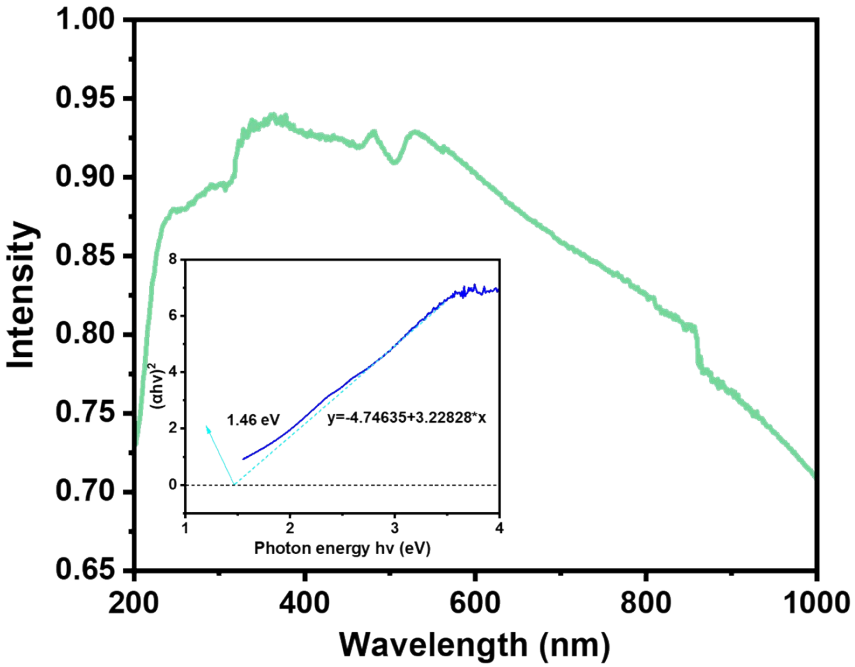


Fig. S7. The light absorbance and band gap.

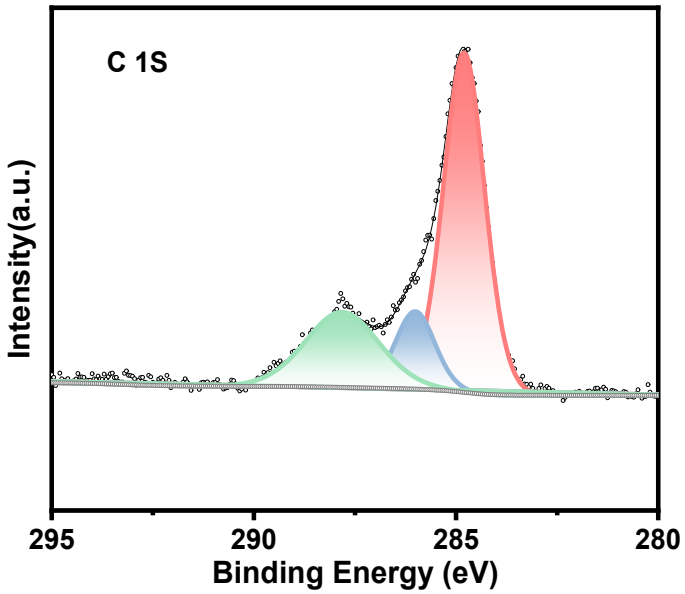


Fig. S8. C1S X-ray photoelectron spectroscopy for the TMO-8 after cycling tests.

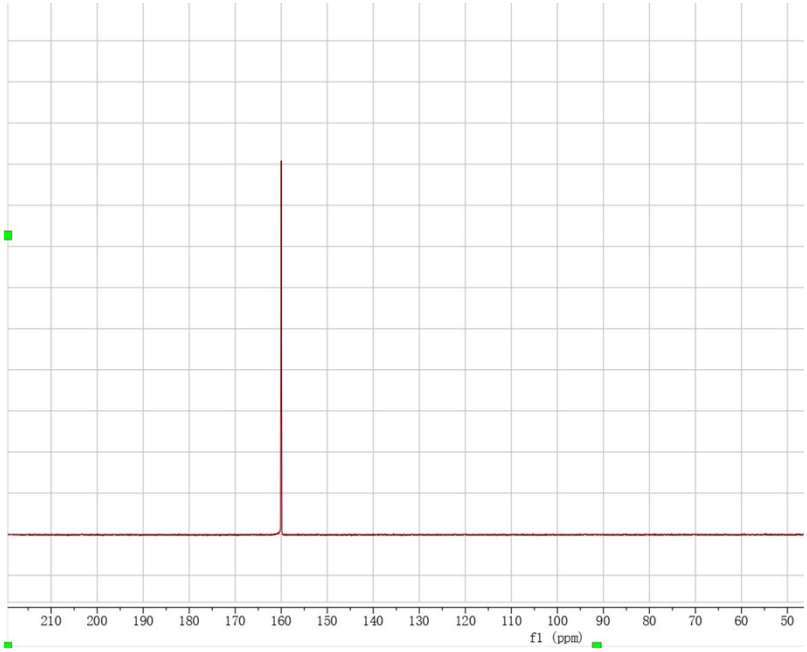


Fig. S9. ^{13}C urea standard sample.

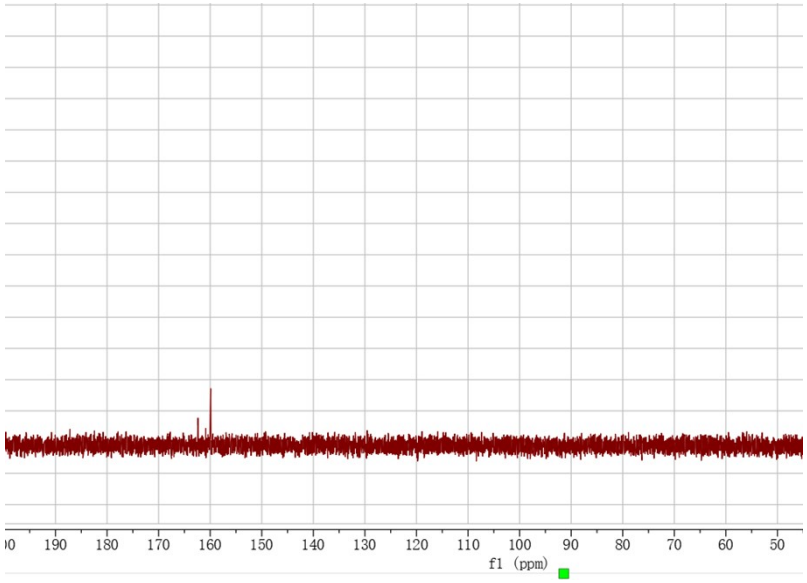


Fig. S10. ^{13}C urea measurement of the sample.

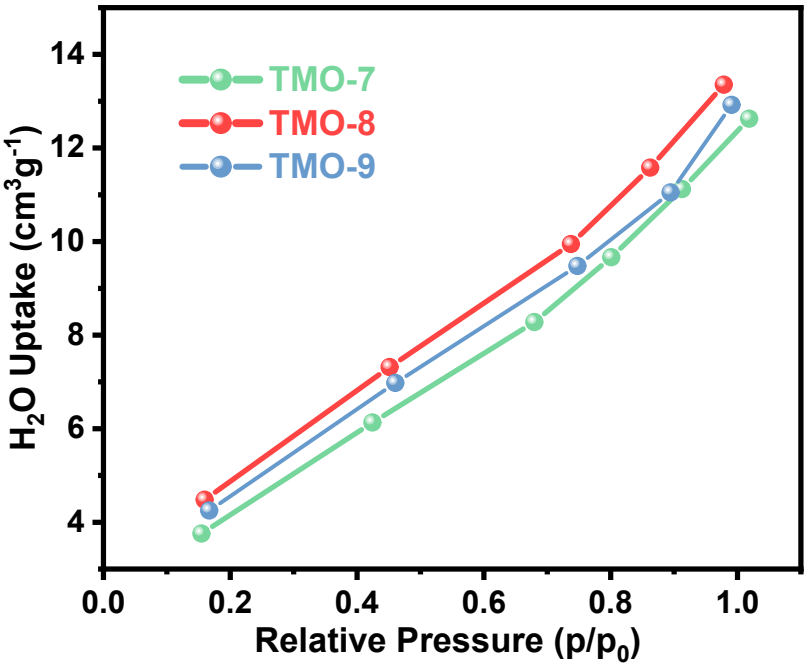


Fig. S11. H_2O gas adsorption–desorption isotherms at 298 K for TMO-*x*

Table S1. Comparison of photocatalytic urea synthesis performance over TMO-8 with recently reported representative photocatalysts.

Photocatalysts	Light source	Catalyst loading	Urea production	Selectivity	N source	References
TiO_2/Mn_2O_3	300 W Xe lamp	0.17 mg/mL	93 μmol g^{-1} h^{-1}	100%	NH_3	This work
Ru–TiO_2	420 nm monochromatic light	-	24.95 μmol h^{-1} g^{-1}	-	N_2	1
Cs_2CuBr_4/TiO_x–Ar	LED lamp (95.34 mW cm^{-2})	-	~0.17 μg h^{-1} L^{-1}	88.45%	NO_3^-	2
Cu SA–TiO_2	365 nm monochromatic light	-	432.12 μg g^{-1}	-	N_2	3
CeO_2-500	300 W Xe lamp	-	15.5 μg h^{-1}	-	N_2	4
$SrTiO_3$–FeS–$CoWO_4$	300 W Xe lamp with 420 nm filter	80 mg/mL -400 mg/mL	8054.2 μg h^{-1} g^{-1}	-	N_2	5
Ni_1–CdS/WO_3	300 W Xe lamp	-	78 μM h^{-1}	-	N_2	6
Pd–CeO_2	300 W Xe lamp	-	9.2 μmol h^{-1} g^{-1}	-	N_2	7
SiW_6Mo_6@MIL-101(Cr)	300 W Xe lamp	-	1148 mg h^{-1} g^{-1}	100%	N_2	8
Ti^{3+}–TiO_2/Fe–CNTs	300 W Hg lamp	-	710 μmol L^{-1} g^{-1}	-	N_2	9
NCP/ZIS	300 W Xe lamp	-	19.6 μmol g^{-1} h^{-1}	-	N_2	10

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