Supporting Information

Exposing high-activity (111) facets CoO octahedral Loading MXene Quantum dots of Efficient and Stable Photocatalytic H_2 Evolution

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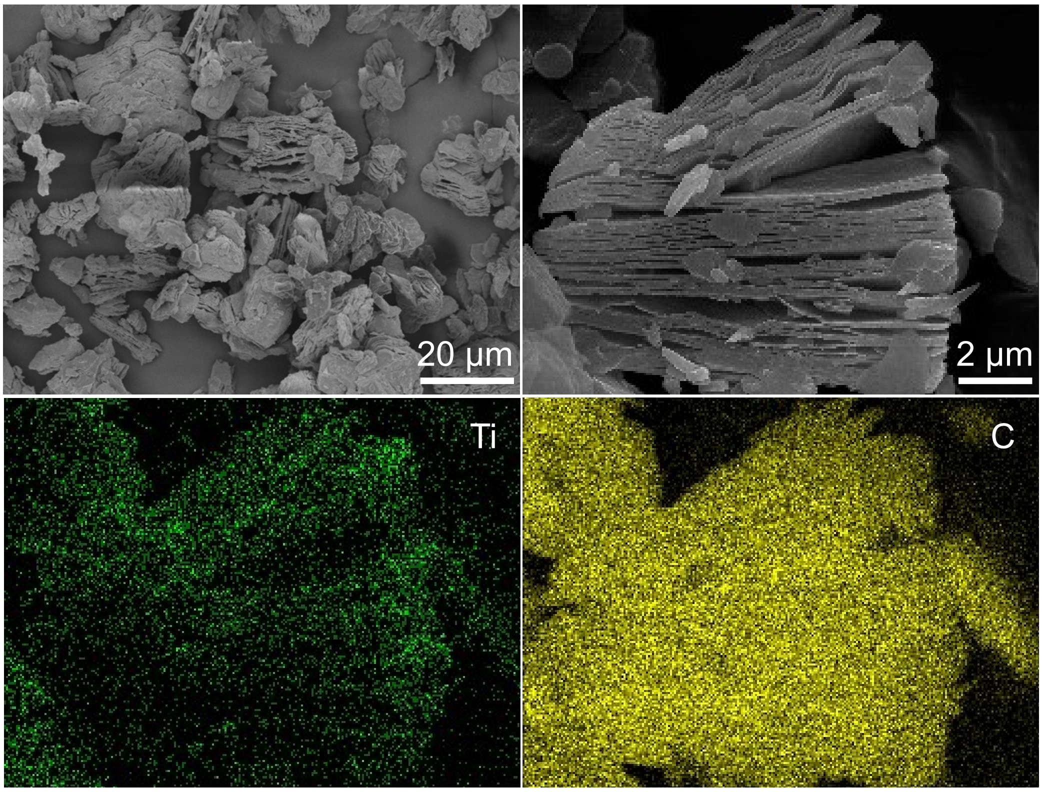

Fig. S1. SEM image and elements scanning for Ti_3C_2 MXene.

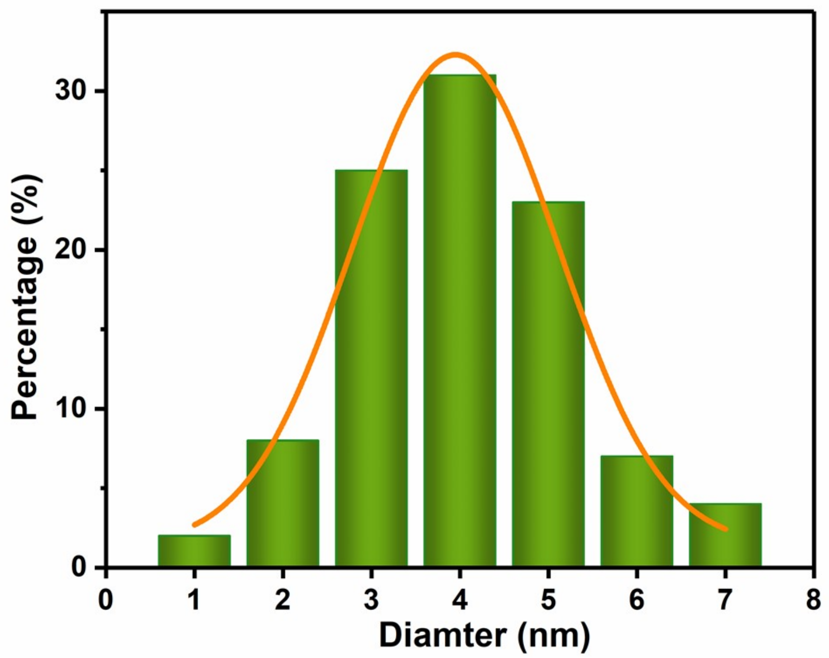

Fig. S2. Diameter distribution for N-MQDs.

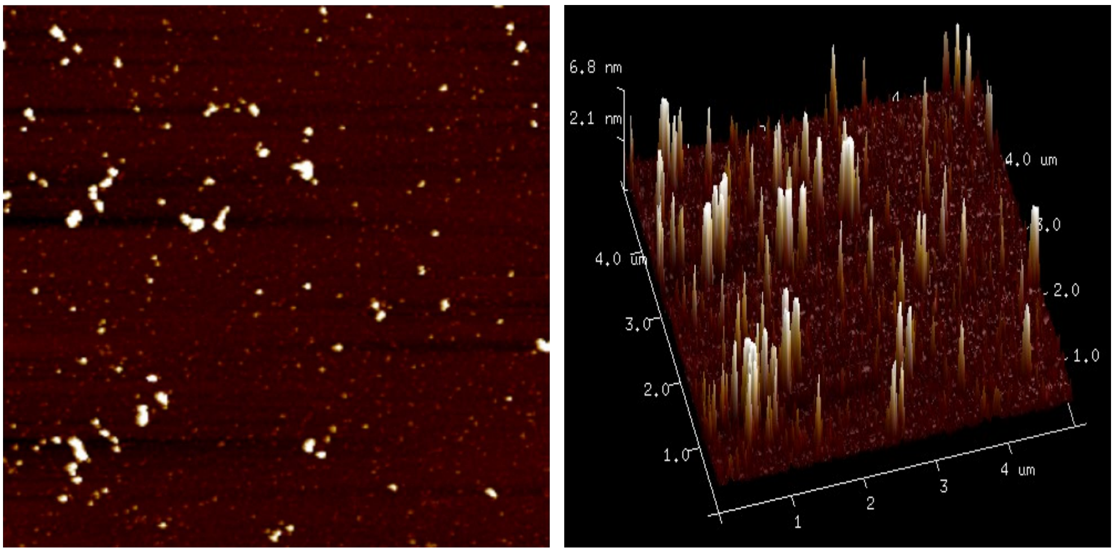

Fig. S3. AFM image and 3D AFM rendered image for N-MQDs

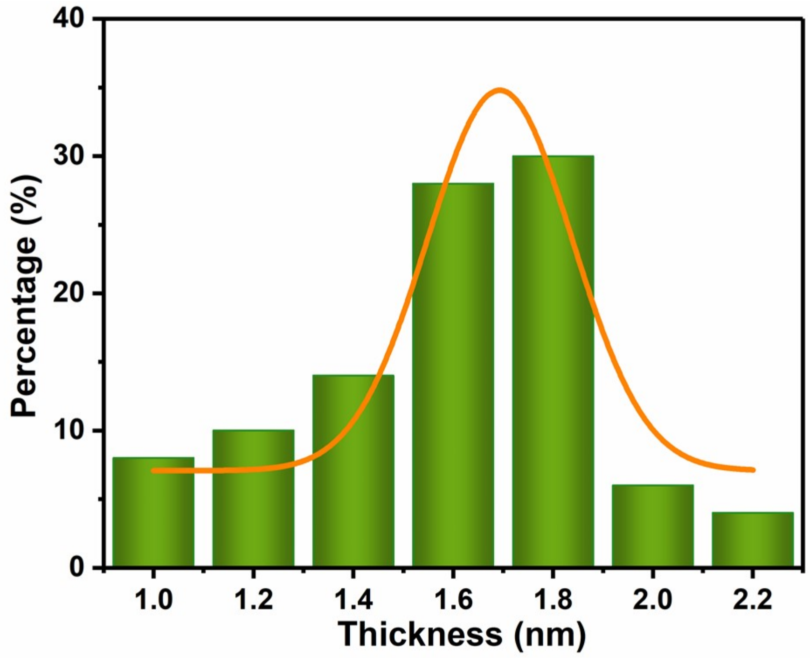

Fig. S4. The height size distribution for N-MQDs.

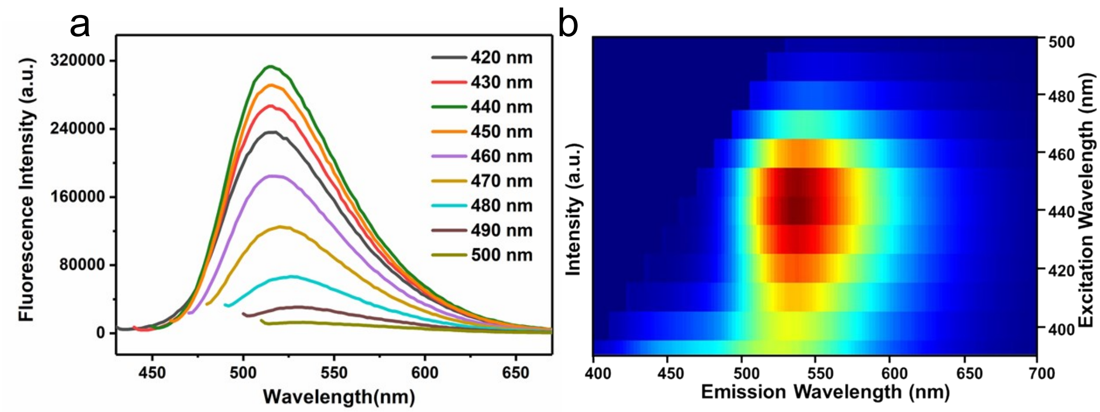

Fig. S5. (a) PL spectra for N-MQDs. (b) excitation-emission matrix.

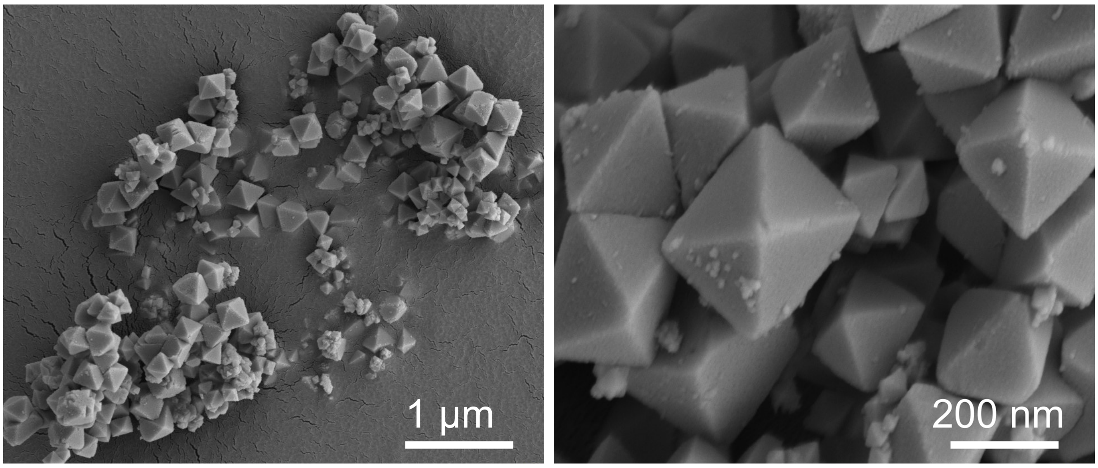

Fig. S6. SEM images for octahedral CoO.

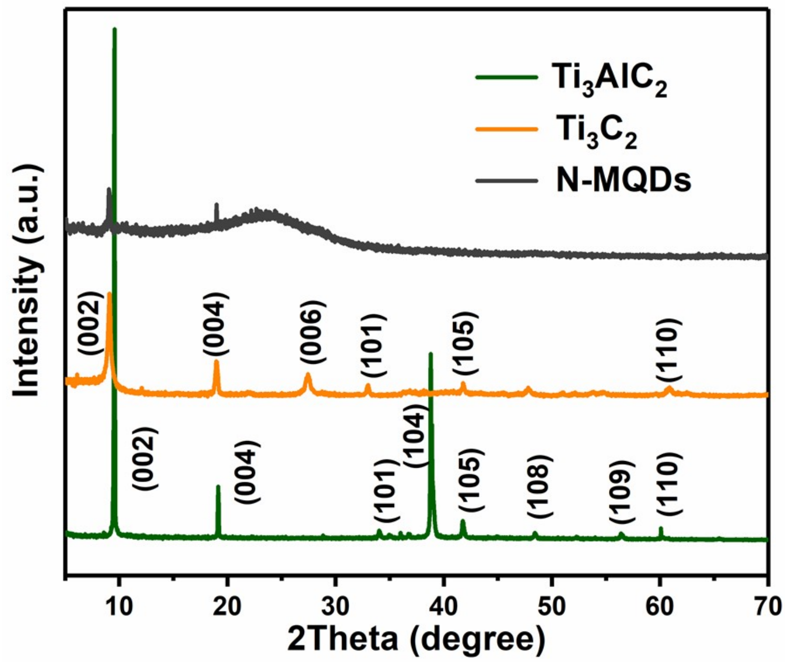

Fig. S7. XRD patterns for Ti_3AlC_2 powder, Ti_3C_2 MXene, and N-MQDs.

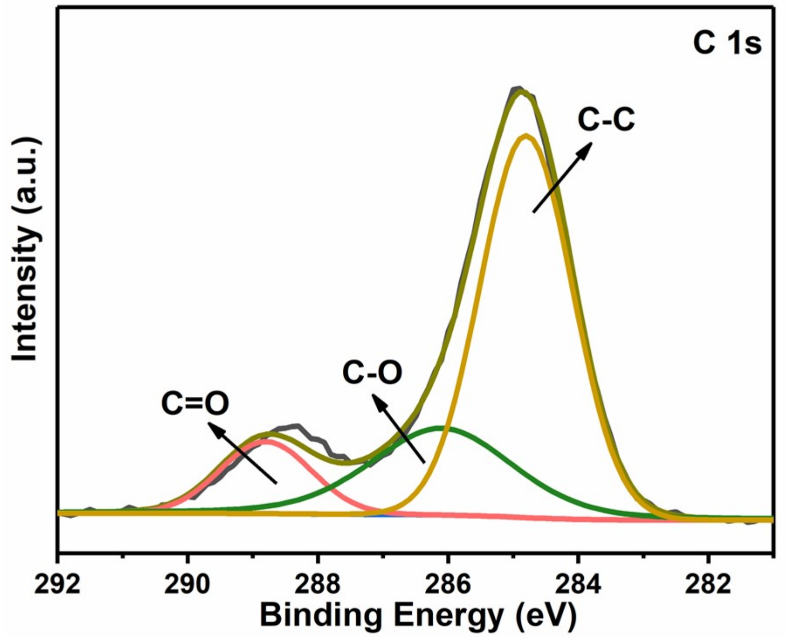

Fig. S8. C 1s XPS spectra for CoO.

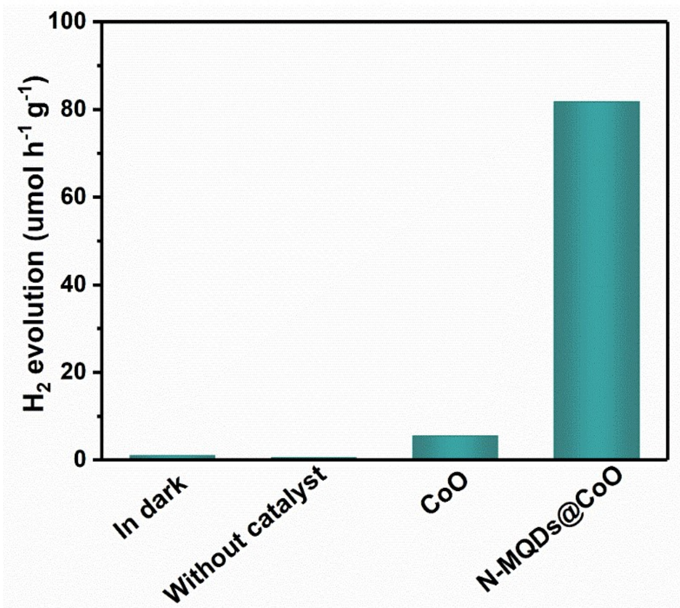

Fig. S9. The comparison of H_2 production rates with different environments.

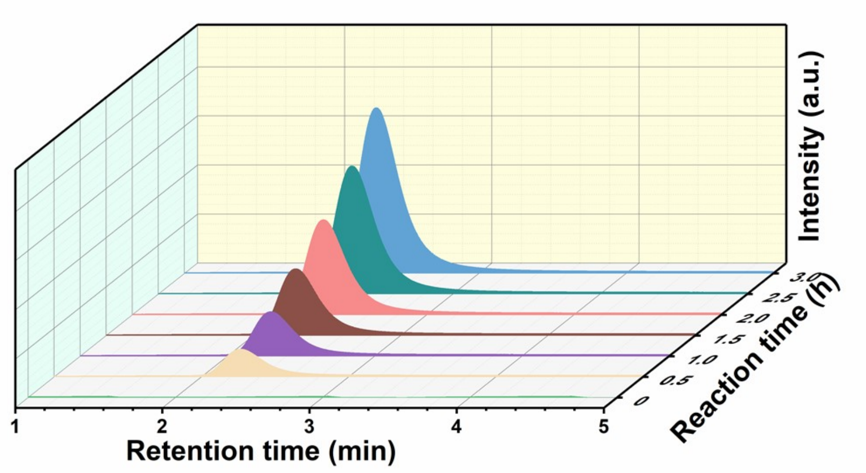

Fig. S10. Time-dependent gas chromatograms H_2 production for N-MQDs@CoO.

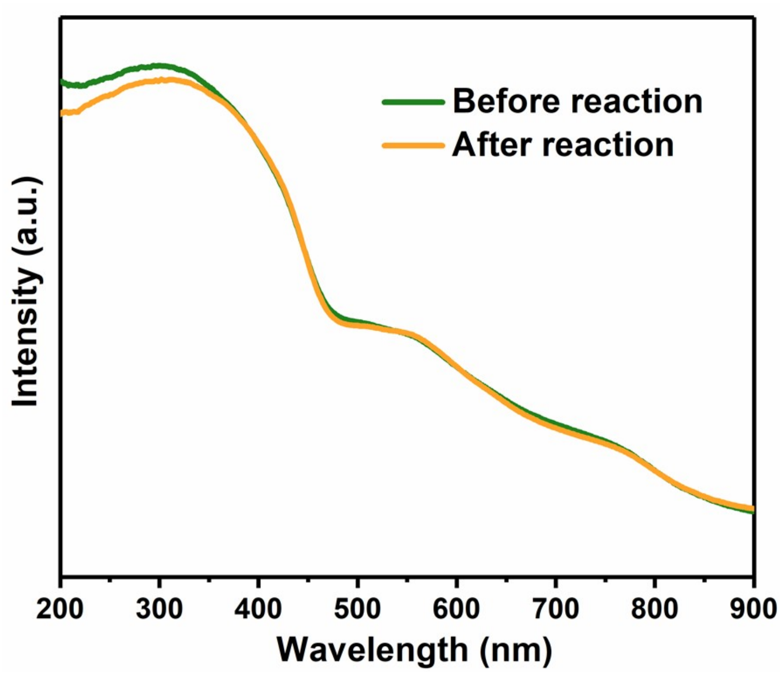

Fig. S11. (a) UV-visible DRS for the recycled catalyst after 4 cycles.

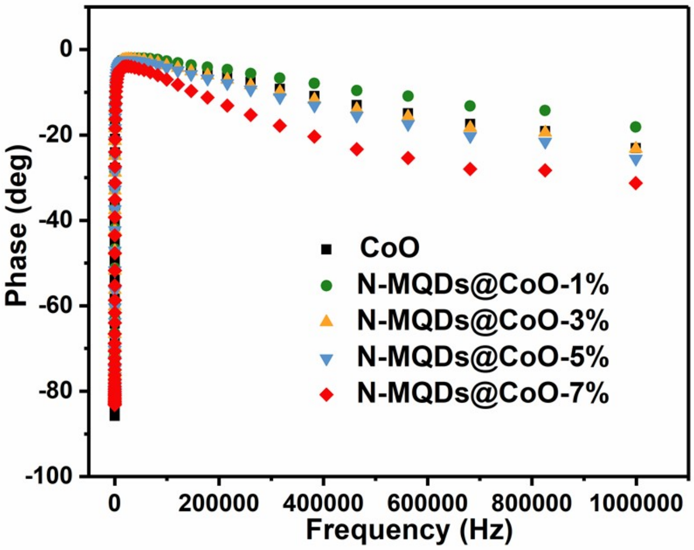

Fig. S12. The Bode-phase for pure CoO and N-MQDs@CoO.

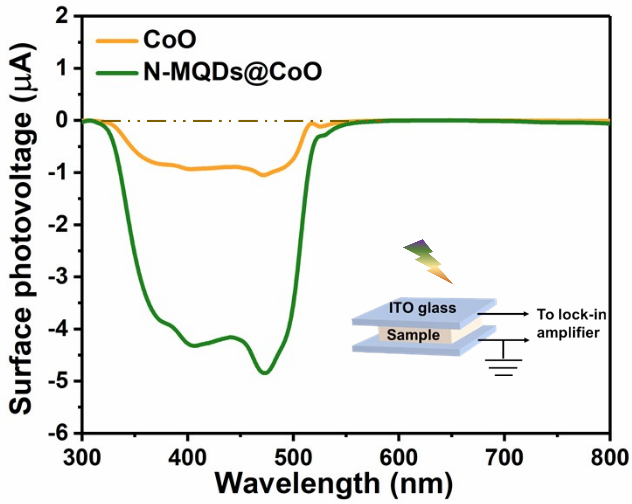

Fig. S13. The SPV spectrum for pure CoO and N-MQDs@CoO.

Table S1. Entries in the table are fitted from EIS results

Sample	R_s/Ω	R_{ct}/Ω	C_p
CoO	27.72	23660	4.41×10^{-4}
N-MQDs@CoO-1%	18.65	16360	2.48×10^{-3}
N-MQDs@CoO-3%	9.02	4375	2.11×10^{-4}
N-MQDs@CoO-5%	4.48	1715	1.32×10^{-4}

N-MQDs@CoO-7%	7.45	1044	1.91×10^{-3}

Table S2. The average fluorescence lifetimes for CoO and N-MQDs@CoO

Sample	lifetime τ(ns)	Pre-exponential Factors B	Average lifetimes τ(ns)	X_2
CoO	τ_1=2.01	B_1=3133.26	2.19	1.168
	τ_2=8.17	B_2=36.55		
N-MQDs@CoO-1%	τ_1=3.26	B_1=998.73	4.52	1.098
	τ_2=9.94	B_2=2042.98		
N-MQDs@CoO-3%	τ_1=5.50	B_1=921.90	6.39	1.046
	τ_2=10.09	B_2=2059.96		
N-MQDs@CoO-5%	τ_1=7.22	B_1=2906.34	8.43	1.063
	τ_2=15.98	B_2=109.41		
N-MQDs@CoO-7%	τ_1=7.27	B_1=2788.07	6.81	1.086
	τ_2=12.54	B_2=274.42		

Table S3. Comparison for different CoO-based materials

Photocatalyst	Light source	Catalyst dosage (mg)	H_2 evolution rate	Ref.
N-MQDs@CoO	≥ 420 nm	10	81.6 μmol g^{-1} h^{-1}	This work
CoO@MoS_2	>400 nm	50	21.4 μmol g^{-1} h^{-1}	[1]
CoO/NiCo-LDH	>420 nm	40	1.5 mmol g^{-1} h^{-1}	[2]
CoO/g-C_3N_4	>400 nm	50	50.2 μmol g^{-1} h^{-1}	[3]
CoP/CoO	>420 nm	50	43.4 μmol g^{-1} h^{-1}	[4]
a-CoO/GO	>400 nm	50	21.1 μmol g^{-1} h^{-1}	[5]
rGO@CoO	≥ 420 nm	50	830 μmol h-1 g-1	[6]
CDs/CoO	>400 nm	50	33.4 μmol g^{-1} h^{-1}	[7]

References

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