

## Supporting Information

### Enhancement of visible-light-driven CO<sub>2</sub> reduction performance using amine-functionalized zirconium metal-organic framework

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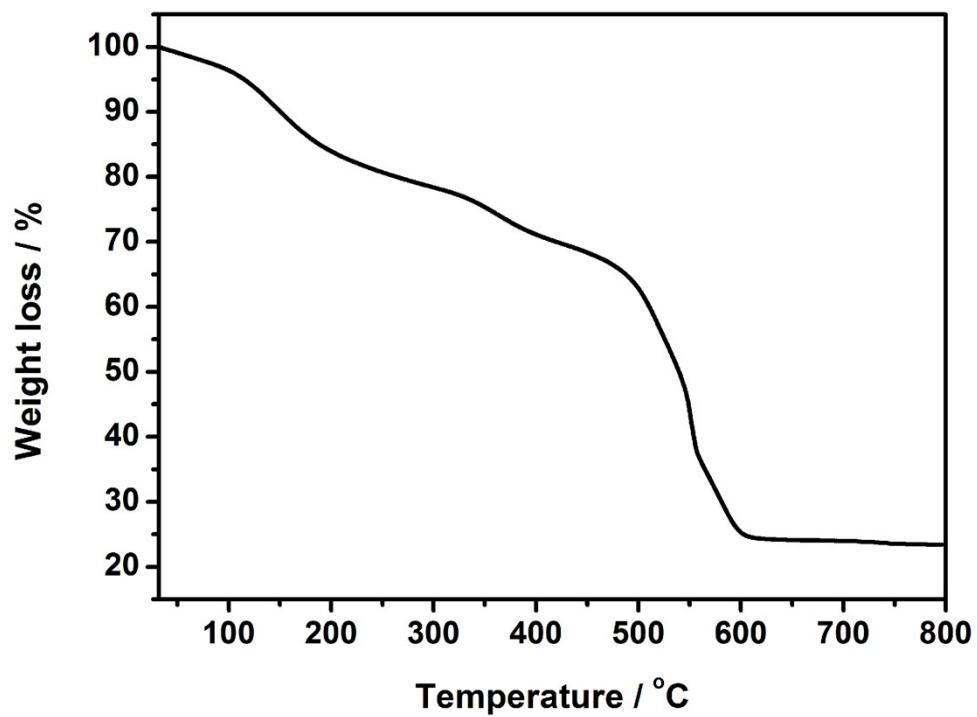
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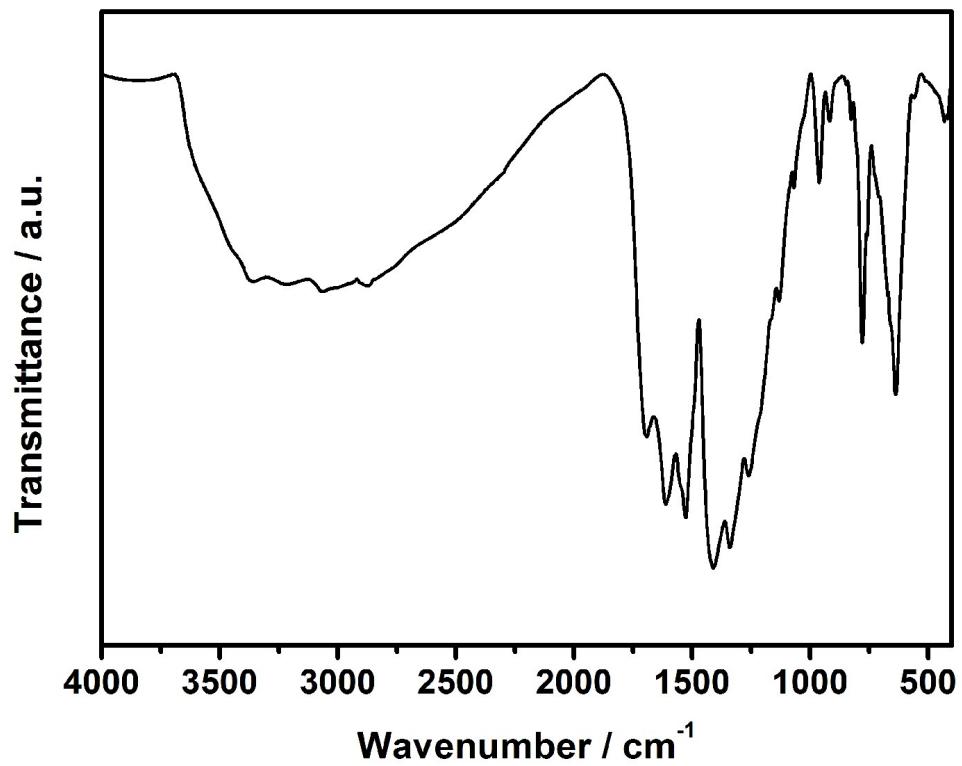
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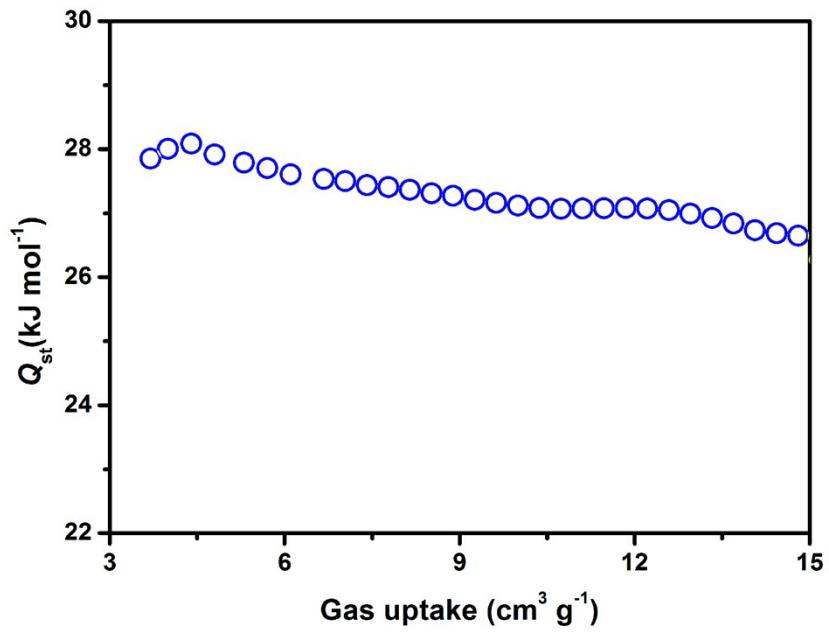
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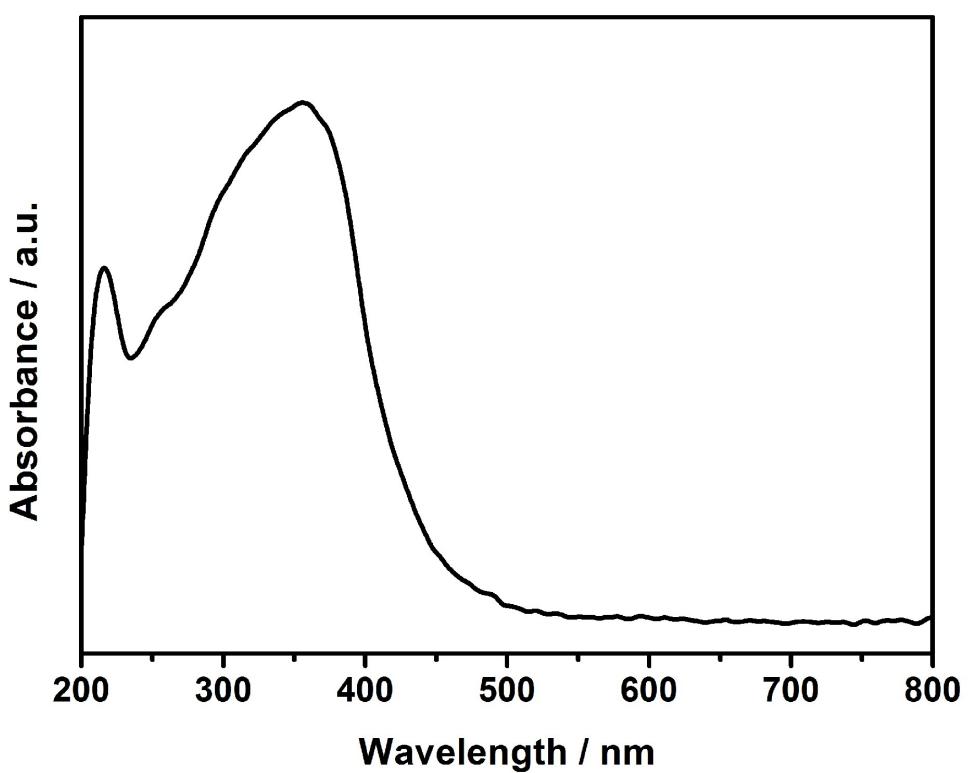
**Fig. S1** The TG curve of as-synthesized Zr-SDCA-NH<sub>2</sub>.



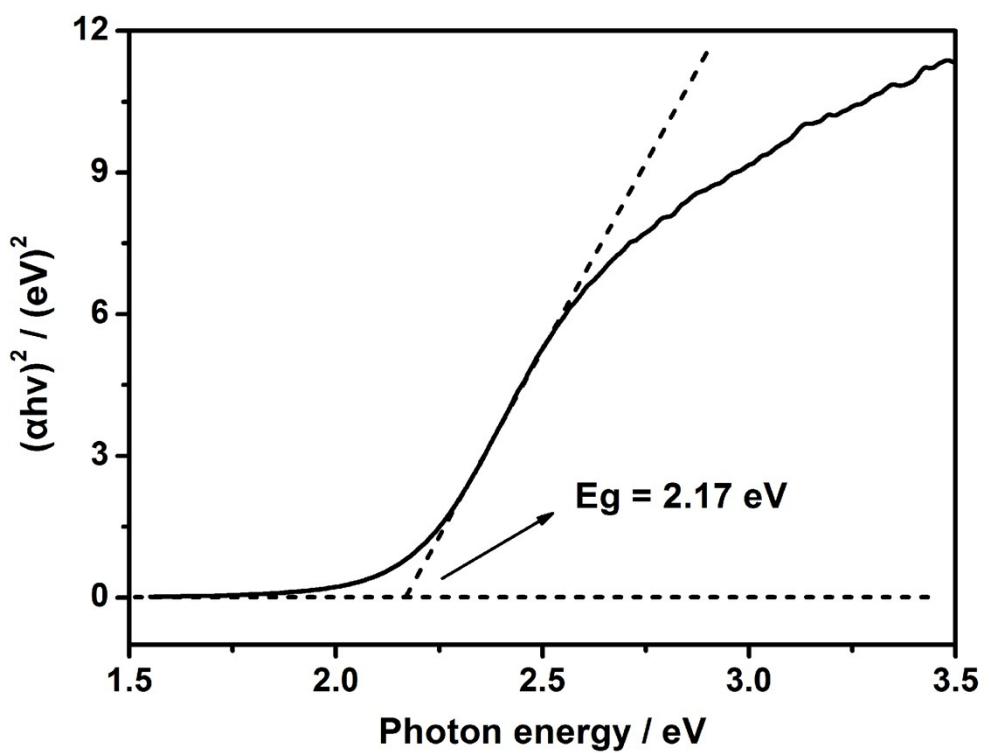
**Fig. S2** The IR spectrum of as-synthesized Zr-SDCA-NH<sub>2</sub>.



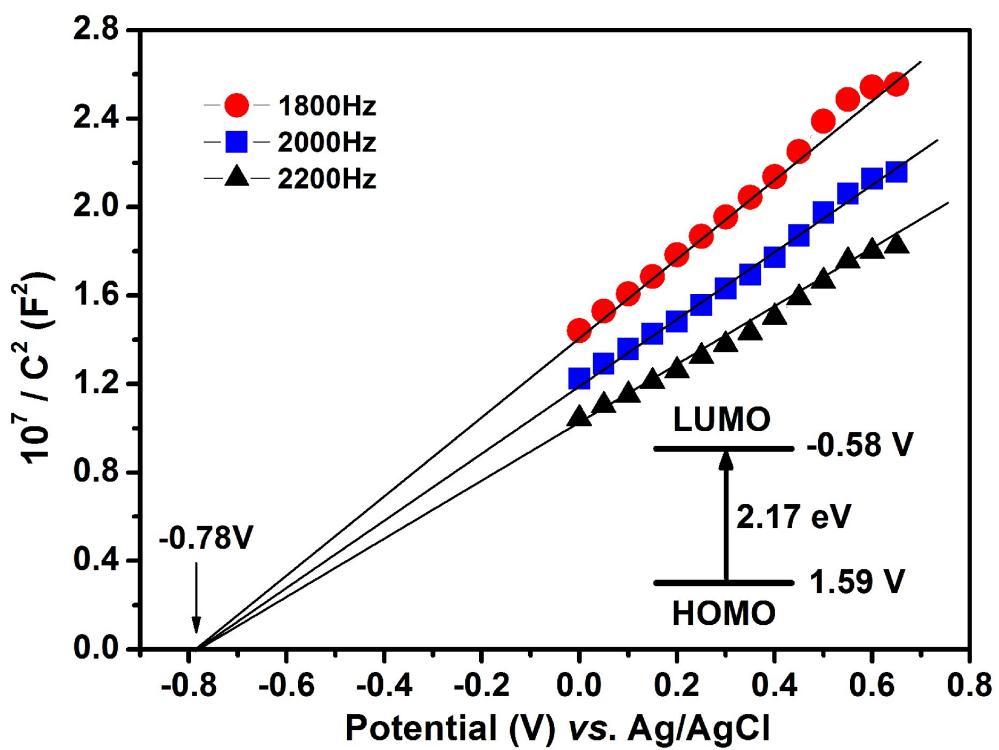
**Fig.S3** The isosteric heat ( $Q_{st}$ ) of  $\text{CO}_2$  adsorption for Zr-SDCA-NH<sub>2</sub> calculated from the  $\text{CO}_2$  adsorption isotherms at 273 and 298 K, employing the Clausius-Clapeyron equation.



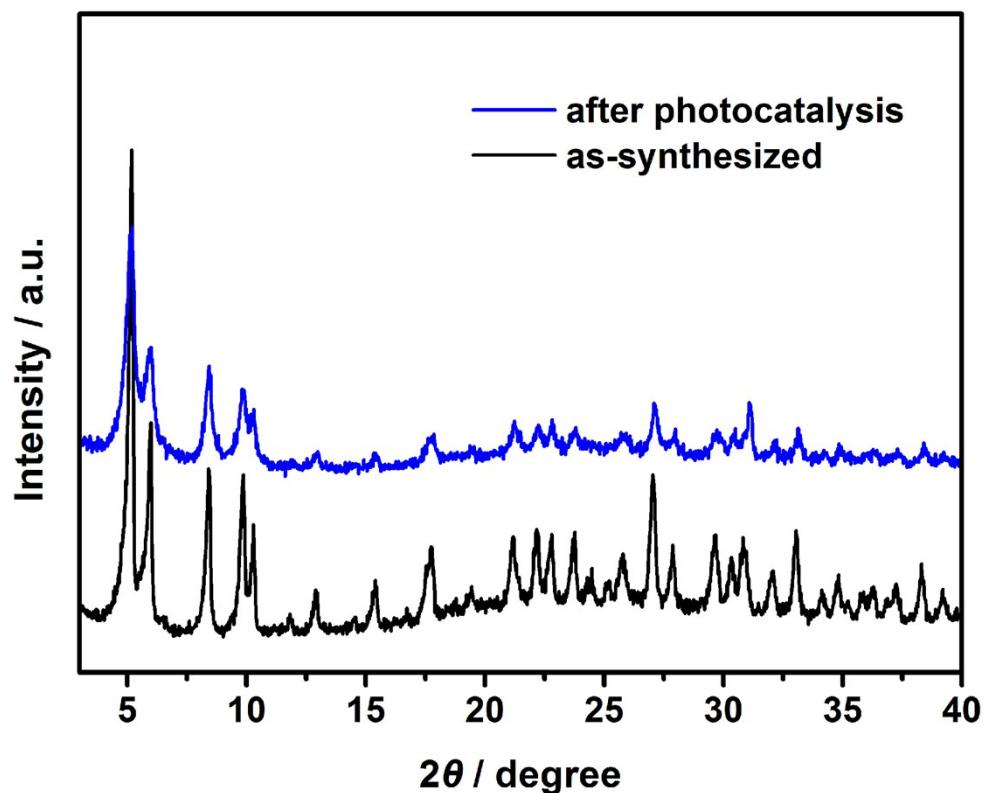
**Fig. S4** The UV–vis spectra of H<sub>2</sub>SDCA ligand in the solid state.



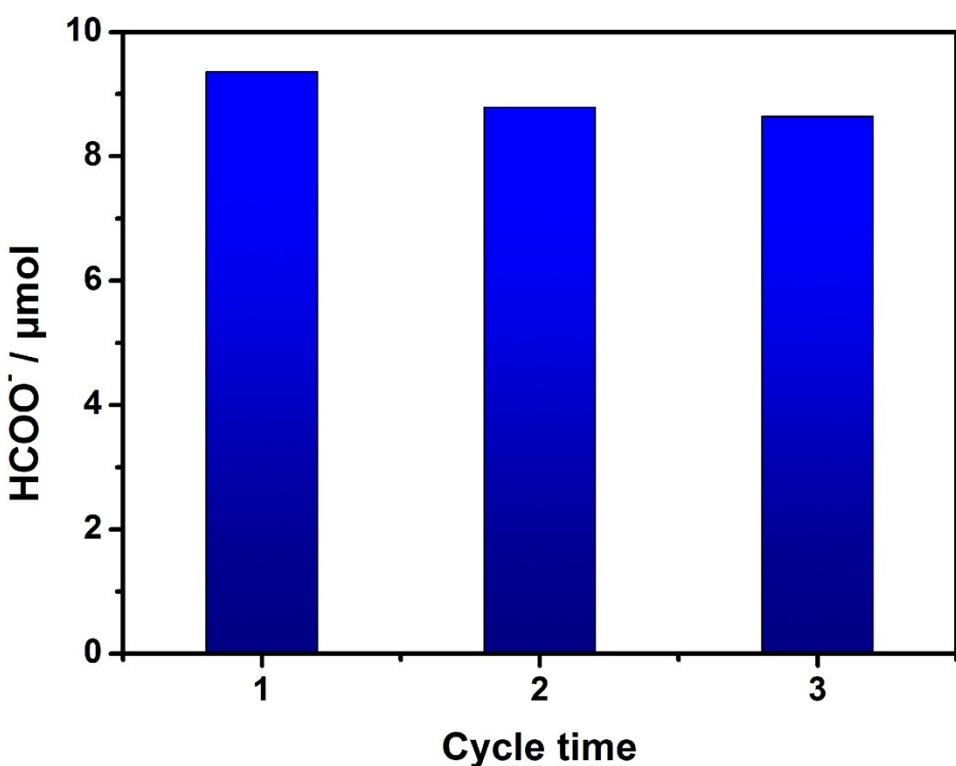
**Fig. S5** The Tauc plot of H<sub>2</sub>SDCA-NH<sub>2</sub> ligand.



**Fig. S6** Mott-Schottky plots of H<sub>2</sub>SDCA-NH<sub>2</sub> ligand in 0.2 M Na<sub>2</sub>SO<sub>4</sub> aqueous solution.



**Fig. S7** The PXRD pattern of Zr-SDCA-NH<sub>2</sub> after the photocatalytic experiment.



**Fig. S8** The recycling of Zr-SDCA-NH<sub>2</sub> for CO<sub>2</sub> photoreduction under 6 h visible light irradiation.

**Table S1** The visible-light-driven photocatalytic performances of amine-functionlized Zr-MOFs for CO<sub>2</sub> reduction to produce formate

material	average formation rate of HCOO <sup>-</sup> [μmol/h·mmol <sub>MOF</sub> ]	catalytic sites	light absorption region of MOFs [nm]	constitution <sup>a</sup>	Ref.
H <sub>2</sub> N-UIO-66(Zr)	46.3	metal cluster	200 440	Zr <sub>6</sub> O <sub>4</sub> (OH) <sub>4</sub> (L <sub>1</sub> ) <sub>6</sub>	1
Mixed H <sub>2</sub> N-UIO-66(Zr)	73.4	metal cluster	200 550	Zr <sub>6</sub> O <sub>4</sub> (OH) <sub>4</sub> (L <sub>1</sub> ) <sub>4.8</sub> (L <sub>2</sub> ) <sub>1.2</sub>	1
H <sub>2</sub> N-UIO-66(Zr,Ti)-120-16	71.9	metal cluster	200 480	Zr <sub>2.6</sub> Ti <sub>3.4</sub> O <sub>4</sub> (OH) <sub>4</sub> (L <sub>1</sub> ) <sub>6</sub>	2
Zr-SDCA-NH <sub>2</sub>	96.2	metal cluster, organic ligand	200 600	Zr <sub>6</sub> O <sub>4</sub> (OH) <sub>4</sub> (L) <sub>6</sub>	This work

<sup>a</sup> H<sub>2</sub>L<sub>1</sub> = 2-aminoterephthalic acid, H<sub>2</sub>L<sub>2</sub> = 2,5-diaminoterephthalic acid, H<sub>2</sub>L = 2,2'-diamino-4,4'-stilbenedicarboxylic acid.

## References

1. D. Sun, Y. Fu, W. Liu, L. Ye, D. Wang, L. Yang, X. Fu and Z. Li, *Chem.-Eur. J.*, 2013, **19**, 14279-14285.
2. D. Sun, Y. Gao, J. Fu, X. Zeng, Z. Chen and Z. Li, *Chem. Commun.*, 2015, **51**, 2645-2648.